Telegraphic Address:
"RUSSATUS, LONDON."

FEBRUARY, 1896.

Vol. XL.
No. 216.

JOURNAL

OF THE

Royal United Service Institution

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.

Editor - Captain H. GARBETT, R.N. (Retired).

SUMMARY OF CONTENTS.

LONDON:

J. J. KELLIHER & CO., 17B, GREAT GEORGE STREET (*Corner of Parliament Street*), S.W., AND 33, KING WILLIAM STREET, E.C.

HODGES, FIGGIS & CO., 104, GRAFTON STREET, DUBLIN.

JOHN MENZIES & CO., EDINBURGH.

Entered at Stationers' Hall.] Price Two Shillings.

AITCHISON'S

PATENT POCKET BINOCULAR

FIELD GLASS

OPEN

CLOSED

Closes to a thickness of one inch.

Does not weigh more than an ordinary Watch.

Made entirely of Aluminium.

Very Powerful.

Superior Achromatic Lenses.

Bernard T. Burningham, Esq., Johnstown, Nebraska, United States of America, *writes*:—"I received the Patent Pocket Binocular Glasses quite safely, and I think they are splendid, they have such great power and are so light. As I spend most of my time on the plains or in the mountains hunting big game, they are just what I want, and I am much pleased with them (Five-Guinea Glass)."

Captain Craig, War Department, Washington, United States of America, *writes*:—"I am directed by the Chief Signal Officer of the United States Army, to say that Aitchison's Patent Pocket Binocular and Field Glasses are found to be extremely convenient and portable, and of good service (Five-Guinea Glasses)."

The Right Hon. Earl Waldegrave *writes*:—"I enclose cheque for £3 3s. for the Patent Pocket Binoculars, with which I am much pleased."

The Right Hon. Earl Nelson *writes*:—"I am much pleased with the Three-Guinea Patent Pocket Binocular Glass. It is light, compact, and easy of adjustment, clear and extensive in its field of vision."

The Right Hon. the Earl of Lonsdale *writes*:—"Mr. Aitchison's Patent Pocket Binoculars are satisfactory in every way, and answer their purpose well."

THE MOST USEFUL FIELD GLASS FOR MILITARY PURPOSES IN EXISTENCE.

No. 1.—Achromatic Lenses £3 3 0

A thoroughly useful glass for Naval, Military, and Field purposes.

No. 2.—Ditto, 12 Lenses, extra power ... £5 5 0

Above are complete with Soft Leather Purse Case, Post Free to any part of the World.

Hard Leather Military Sling Case, **5s.** extra.

ILLUSTRATIONS & PARTICULARS POST FREE.

AITCHISON & Co., 428, STRAND, LONDON.

(Opposite Coutts' Bank.)

CITY DEPOTS: 47, FLEET STREET, & 6, POULTRY, LONDON, E.C.

SENT on APPROVAL on RECEIPT of DEPOSIT.

CONTENTS FOR FEBRUARY, 1896.

MILITARY PRIZE ESSAY, 1896.

COLONEL F. C. TRENCH GASCOIGNE, V.D., 2nd Yorkshire Volunteer R.E., late Captain 66th Foot, who last year placed at the disposal of the Council a sum of sixty guineas to be given to the writers of the two best Naval Prize Essays, has again given to the Council another sum of sixty guineas as prizes for the writers of the two best Military Essays for this year's competition. The Council have arranged that forty guineas shall be given with the Gold Medal of the Institution, which will fall to the writer of the best Military Essay in the annual competition, and twenty guineas to the writer of the essay next in order of merit.

The awards to be called the R.U.S.I. Gold Medal and First Gascoigne Prize, and Second Gascoigne Prize.

The following is the subject for the Essay for the year 1896:—

"The relative advantages and disadvantages of Voluntary and Compulsory Service, both from a Military and a National point of view."

The following Lectures have been settled since the List of Lectures to be delivered before Easter was published:

FEBRUARY 27th (THURSDAY) at 3 p.m.

"On the necessity of an Army as well as a Navy for the Maintenance of the Empire." Captain W. H. James, late R.E.

Chairman:

Field-Marshal Viscount Wolseley, K.P., G.C.B., G.C.M.G., Commander-in-Chief.

MARCH 18th (WEDNESDAY) at 3 p.m.

"Elements of Force in War-Ships." Vice-Admiral P. H. Colomb.

J. J. K. & Co., LONDON.

The new first-class Battle-ship "MAJESTIC," 14,900 tons, 12,000 I.H.P., Flag-ship of the Channel Squadron.

Reproduced by permission from a Photograph by Symonds & Co., Portsmouth.

THE JOURNAL
OF THE
ROYAL UNITED SERVICE INSTITUTION.

VOL. XL. FEBRUARY, 1896. No. 216.

[*Authors alone are responsible for the contents of their respective Papers.*]

Wednesday, November 13th, 1895.
Vice-Admiral P. H. COLOMB in the Chair.

THE PRODUCTION OF MODERN WAR MATERIAL IN THE UNITED STATES OF AMERICA.

By Captain WILLIAM H. JAQUES
(Late United States Navy).

The CHAIRMAN: In his own country it would be unnecessary to say a single word in introducing the lecturer to-night. In this country it is not necessary to say much. Captain Jaques was a graduate of the Naval Academy in America, and served for some years in the American Navy. For a large number of years he has been directly connected with the matters of which he treats, and constantly employed by the United States Government on different commissions connected with these subjects; and he is, besides, in our own country, a member or a fellow of most of the great societies which deal with the matter he has in hand. Therefore, there is no man more qualified to address us on this subject than Captain Jaques.

LECTURE.

THE indifference of the United States for nearly a quarter of a century to the question of national military defence placed a somewhat unusual responsibility upon the members of the Gun Foundry Board, which visited this country in 1882. Although I have prepared for the British societies, with which I am connected, several papers on the subject of war material, this is the first chance I have had to personally thank His Grace the Duke of Devonshire, who, at that time Lord Hartington, was Secretary of State for War, and also many of you who so courteously extended to us those civilities and opportunities, which enabled us to lay the foundation of that report upon which was based the development of the modern war material now used in the United States.

The freedom with which the results of our experiments and the details of our productions are exploited in the daily press somewhat

handicaps a lecturer when he desires to present the conclusions reached, or describe the methods employed and the productions themselves. The press of the United States is not alone in its desire to give readers the very earliest possible information; for the editors of our scientific journals and the secretaries of our technical institutions are also fully alive to the necessity of giving early publication of all progress made to the members of their associations.

My own very close connection with what has been done in the United States in the production of war material has necessitated a frequent expression of my opinion; and, in order not to repeat, except by way of emphasis, my estimates and conclusions upon the different elements of war-ship design and equipment, I have asked the privilege of presenting to you graphically what has been accomplished in my own country in the construction of war-ships, the building of guns and armour, and their tests, calling to my assistance the power of lenses and the oratory of photography, in lieu of scientific word expression.

Since February 16th, 1884, we have made wonderful strides in the development of war material, and we feel that we are again coming to the front rank in quality and type, even if we may be wanting in quantity.

Although the demands upon the ordnance engineer are enormously greater in England than in the United States, it is difficult to realise even in Great Britain what extensive sums have been expended by the leading Powers of the world for the care and development of their armies and navies.

I have heard many expressions of surprise at the rapidity with which we accomplish great undertakings. In many directions this is true, but you still have the advantage of us (and it is but natural that you should) in the time and cost of construction of the larger types of war-ships.

For convenience, I will divide my paper to-day into three parts, relating, respectively, to the built-up gun, the wire-wrapped gun, and armour; and, as most of my initial work was done at the Bethlehem Iron Company's works, I will ask you to spend a few moments with me there (in South Bethlehem, Pennsylvania), where, as ordnance engineer, I was so intimately associated with Mr. John Fritz, for many years its chief engineer and superintendent, and before the Directory of which I laid in May, 1885, a detailed plan for the erection and equipment of suitable works for the production of guns, armour, and shafting, transferring to them the inaugural machinery and information for the successful accomplishment of my project, which was based upon the investigations and conclusions of the Gun Foundry Board of 1882 and 1883.[1]

Notwithstanding the extent to which experiments in gun construction have been conducted, all the principal nations in the world use one of two types, viz., the built-up, or the wire-wrapped; and the steel-cast gun remains further than ever from general service use. As the means have been supplied for producing larger parts, their number and proportions have decreased and increased, respectively, and nearly every metal, except gold

[1] The lecturer here exhibited several lantern views of the Bethlehem Iron Works.

and silver, has been alloyed with iron with a view of securing increased elastic strength.

The substitution of smokeless powders having for their base nitro-glycerine and gun-cotton, has, perhaps, been a more radical departure than anything that has been done in gun construction itself, and there is no element in the provision of gun construction which has a more important bearing than the powder which is to be employed.

You appear to have been more successful here with your cordite than anyone else has been. In the United States we are still quite at sea as far as powder is concerned. Three or four makers have spent a great deal of money, and have on many occasions more than fulfilled the conditions laid down by the Departments, but the Navy Department especially has such fear of nitro-glycerine powders that it has practically prohibited their use. Very little smokeless powder has been issued in the United States for general service, but the Navy Department believes that it has secured at its torpedo station manufactory a smokeless powder with a gun-cotton base that will give high ballistic results, combined with safety and stability. A considerable amount of Leonard and Peyton American powder has been ordered for the new army rifle, and several lots for experimental work have also been purchased.

A new American smokeless powder, known as the Maxim-Schupphaus, differs from the Leonard and other nitro types by combining from 5 per cent. to 10 per cent. of nitro-glycerine with from 94 per cent. to 89 per cent. of military gun-cotton. The advantage claimed for this composition over cordite and Leonard, which contain 50 per cent. of nitro-glycerine, is its low temperature of combustion, which would reduce the erosion of the bore or the gun lining, if this is due to the heat of the powder gases or liquid products. This advantage is obvious when the temperatures of combustion of nitro-glycerine and gun-cotton are considered; the former burning at 3,000° Fahr., the latter at 2,500° Fahr.

The grain of this powder is also a radical departure from any shape employed heretofore, consisting of a cylindrical stick with seven or more longitudinal perforations of such a size that the area of burning increases as the projectile travels towards the muzzle, thereby giving high velocity with comparatively low pressure. There is no other powder grain that gives such an increase in area of combustion, a large decrease being the rule.

With the 3·2-inch field gun at Sandy Hook, fired under the Government requirements (velocity 1,450 f.s., pressure not to exceed 30,000 lbs. per square inch), 1 lb. 4½ oz. of this powder did the same work with less pressure (22,644 lbs.) than 3¼ lbs. of black powder. Other tests of this powder have been reported from time to time in *Engineering*, *Arms and Explosives*, and other journals.

In laying before you very rapidly the methods employed in the United States for the manufacture of built-up ordnance, I will not repeat the views I have expressed in relation to material, furnace practice, treatment, shrinkage, and erosion, except to emphasise my belief that suitable and sufficient mechanical work is quite as necessary, if not more

so, in the finish of the bore as the selection and chemical proportions of the composition.[1]

A study of the various types of torpedo-boats and destroyers and the changes in yacht design in the search for high speed have led Mr. Herreshoff to suggest the use of some of the ideas introduced into the "Defender" for torpedo-boats, and the United States Government has just given him an order for two.

A glance at the two yachting machines which recently competed for the America Cup will be interesting, although it is not expected that the naval architect will gain much from them that will be useful in war-ships. In fact, they have ceased to be yachts; they are simply racing machines, the hull a fulcrum with the fin, or fixed centre-board, on one side, and the sail power on the other.

In assembling the parts of the gun the degree of accuracy of the shrinkage is at least 98 per cent. of the calculations. It is more difficult, however, to prevent the erosion of the bore. Until we get a propelling agent that will not cut the bore so badly, we must keep in the mechanics' hands, increase the work, and construct the gun so that the barrel can be readily and economically replaced.

By cold-rolling the tubes higher elastic strength and greater resistance to erosion will be obtained, and if the life of a gun is limited by its erosion (which is apparently the case) the increased cost to provide the power requisite for this additional mechanical work will be more than compensated by the longer life of the gun. If the addition of an alloy will facilitate this work, so much the better.

The nickel-steel gun forgings made while I was at Bethlehem show an increase of 25 per cent. in elastic strength, with but a slight reduction of the contraction of area as compared with plain steel.

If we can still further increase these qualities by cold rolling, we shall have material that will not only stand the increased pressures demanded, but will also withstand the erosive inroads which so manifestly control the life of our heavy ordnance.

Although, since my entry into civil life, I have had a definite plan of gun construction, I have not presented it before, because I wanted first to accomplish the means of producing the few parts I deemed necessary for a stiff, elastically strong, high-power gun. My gun will be made of a few hollow, press-forged, cold-drawn, taper cylinders of alloyed steel, one in each layer, assembled by hydraulic power in such a manner that it can be taken apart as easily as the wire-wrapped guns now being fabricated at your Royal Arsenal.

Unge, the Swedish engineer, proposes to construct all guns as smooth bores and to fit the projectiles with gas-checks, proposing to give the gun itself an axial rotary motion. Fitting gas-checks to the projectiles them-

[1] The lecturer here exhibited seventy-seven views, representing all the operations of the production of gun steel and shafting, army and navy gun shops with their equipment, comparisons of steamships and cruisers, torpedo-boat destroyers, the bearing of yacht-design on naval construction, accompanied by an elaborately-detailed explanation of methods and operations.

selves is undoubtedly a move in the right direction, but giving an axial rotary motion to the gun itself is a novelty that may involve too many complications of carriage and fitting.

While the types of breech closing are very prolific, modifications of the Canet-Whitworth devices seem to be most generally accepted, and the de Bange gas-check is adopted by both branches of the Service in the United States.

In presenting illustrations showing the danger of using material that has not been adequately worked, one is impressed with the value of fluid compression and the employment of nickel alloys. I know of no other two things connected with the metallurgy of steel of so great comparative value, and I shall never tire of expressing my surprise at the marked opposition in England to their use. When I first heard of the fluid compressed ingots of Manchester, I was told by some of Whitworth's competitors that the machinery was kept there as a toy to amuse official visitors. When I first saw this so-called toy I received the impression that, if such, it was rather a powerful and expensive one. When I saw it in operation I very readily discovered the benefits of the process, and lost no time in including it in my details of a plant to be erected in the United States.

I am a stronger convert than ever of the value of nickel, and have found it one of the kindest alloys in the composition and treatment of steel that I have ever had to deal with. I am sure its universal use cannot much longer be delayed, even in conservative England.

At the last Summer Meeting of the Naval Architects in Paris I called attention to the fact that in the United States nickel steel has been largely employed for armour, guns, shafting, hammer and piston rods, torpedo reservoirs, bicycle tubing, and wire; and that it had been ordered for ship and boiler plates. Since then, the boiler plate which has been delivered by the Carnegie Company to our Navy Department has shown the following excellent physical properties:—

Tensile	85,000 lbs.
Elastic	60,000 „
Elongation	25 per cent. in 8 inches,

and also passed excellently the usual quenching and bending tests.

In gun carriages and mounts both our Navy and War Departments have followed European practice—our mortars are mounted on Canet, Whitworth, and Easton and Anderson types; while Krupp and Schneider have furnished working samples for the development of carriages for the heavier guns.

Gorden and Crozier-Buffington modifications have been adopted by the army.

Whether the apparent slowness in the development of armour-piercing projectiles is due to the rapidity with which increased ballistic resistance of armour has been obtained, or whether the want of advancement is due to the extreme difficulty in securing uniform composition and treatment, which will fit the projectiles for the enormous amount of work they are called upon to perform, is, perhaps, difficult to decide; but in

this direction the United States seems to have gone rapidly to the fore, and, apparently, in the Wheeler-Sterling projectiles we find a type combining uniformity, surety of production and perforating power which are not so readily obtained by any other makers in the world.

The works of the Sterling Steel Company are situated in Pittsburg, Pennsylvania, where in addition to projectiles, a large quantity of mercantile crucible steel is turned out. The capacity of the projectile department is equal to twenty 10-inch armour-piercing shells per day, or an equivalent tonnage of other calibres. This is a very large output, when compared with establishments in other parts of the world making armour-piercing shell.

The present requirement for armour-piercers in the United States is, that they shall perforate, unbroken, an ordinary steel, oil-hardened, and annealed plate of a thickness equal to a calibre and an eighth. The Sterling Steel Company has proposed to submit its shells hereafter to tests against face-hardened plates. There have been no instances in the United States of armour-piercing shell perforating nickel-steel Harvey-treated plates unbroken, or being fired against them and rebounding, or remaining in the plate uninjured, with the exception of those made by the Sterling Steel Company, although a considerable number of imported armour-piercers have been used in the ballistic tests.

The following tests of Wheeler-Sterling armour-piercers are interesting:—

July 12th, 1894.—A 12-inch projectile weighing 850 lbs. was fired at a 17-inch nickel-steel Harvey barbette plate, with a striking velocity of 1,858 f.s. It went through plate and backing and an 18-inch oak upright, and was recovered but slightly injured.

November 2nd, 1894.—A 6-inch projectile weighing 100 lbs. was fired at a 6-inch nickel-steel Harvey plate. It perforated the plate and was recovered practically uninjured.

December 15th, 1894.—A 12-inch projectile weighing 850 lbs. was fired at a 17-inch nickel-steel Harvey barbette plate with a striking velocity of 1,410 f.s. It penetrated $16\frac{6}{10}$ inches and rebounded unbroken set up only ·15 of an inch.

February 24th, 1895.—A 12-inch projectile weighing 850 lbs. was fired against a 14-inch nickel-steel Harvey plate with a striking velocity of 1,858 f.s. It went through the plate and backing, and was recovered whole, with the exception of 1 inch of the point.

June 15th, 1895.—A 4-inch projectile weighing 33 lbs. was fired against a $5\frac{1}{2}$-inch nickel-steel Harvey turret plate with a striking velocity of 2,000 f.s. It penetrated 9 inches, remaining in the plate uninjured.

This company is also supplying the United States Navy Department with a type called "semi-armour-piercers," which have thinner walls and carry a bursting charge. They are built to perforate such a considerable thickness of armour and to burst sufficiently inside, that they have become a new and most formidable kind of shell. They promise to replace not only the ordinary steel-cast explosive shell, but in the quick-firing calibres particularly will undoubtedly be substituted for both ordinary

explosive shell and armour-piercers, because in action it will not be practicable to choose between two or more kinds of shell when fired so rapidly.

Great Britain and Russia are the only nations which have given enough attention to wire-wrapped ordnance to effect a service supply. To enter into a discussion of the value of the two methods would take too long to even suggest a consideration of it at this time.

It is much easier for me to accept the commercial results and to express my appreciation of the value of wire-wrapped ordnance. Mechanically, I like it and believe it can be as efficiently, economically and quickly supplied as the built-up type. It remains, therefore, simply a question of selection.

Wire has been so extensively used in other engineering work that it is remarkable its employment for guns and shafting has been so long delayed. In bridges its graceful value is especially emphasised, and I see no reason why wire-wrapped guns, shafting, and fly-wheels should not attain the same eminence in their respective branches as the Brooklyn Bridge has in bridge construction.

Woodbridge, Longridge, and Schultz lay about equal claims to the paternity of wire-wrapped guns. Woodbridge is an American, Longridge an Englishman, and Schultz a Frenchman.

At the present time, Moch and Very are the principal exponents of the system in France, Schultz having died in 1880. Longridge has been pensioned off by Great Britain, while Woodbridge still continues to design experimental guns which, thus far, have been doomed.

A comparison of the methods of construction of the three types under consideration in the United States—the Brown, Crozier, and Woodbridge—proves that the Brown utilises to the greatest extent the high elastic properties obtained in the segments and wire.

In the built-up gun narrow hoops leave weak zones, and it is probably easier to meet the progressive action of the powder pressure with wire than with taper hoops.

The material should have abundant elastic strength, and the wire should be wound continuous in order that the vibration shall not be broken; if it is, rupture is not only possible but probable. In all cases of ruptures of wire-wound guns they have not been violent; further, in no case has the wire been broken.

I think, with Moch, that the consideration of heat in its effect upon the tensions of wire when the gun is being fired is of value only to emphasise that the gun should not be composed of different metals, whereby different extensions are produced.

The series of hooping or winding offers us less guide to the size and form of the wire to be employed than the mechanical and economical requirements. The construction should not be complicated by an exaggerated number of layers.

That form of wire which is most easily wound, tensioned, and best to receive the subsequent layer and of a size that can be given the high physical characteristics desired, and which has not an abnormal difference

of tension and extension between its axis and exterior when wound, would appear to best suit the conditions of wire construction.

Although piano wire of circular section was used in the beginning, all of the manufacturers and designers of wire guns now use a square or rectangular section.

In modern armour the United States has an enviable record. For the past eighteen months there has been no marked improvement in Bethlehem's plates, the Carnegie Company having at the present time a decided lead. Although Bethlehem's products just manage to pass the first, or cracking shot, cracks are invariably produced by the second; whereas, Carnegie and Krupp are both making plates of superior resisting qualities, frequently standing several blows without developing any important cracks.

Very practical and noteworthy advances in armour making have been given to the public this year, viz., the gas-hardening methods of Schneider and Krupp, and the re-forging process for which the Carnegie Company has been granted patents.

Many elaborate arguments in relation to carburisation have been published, and many novel statements have been presented. The generally accepted view is, that it is effected by the direct and simple contact of iron and carbon. It is well known, however, how important a part the gas carbonic oxide plays in this operation.

As far as I know, I was the first to suggest in the United States that in the carburisation of armour-plate the carbonisation was effected by the gas generated by heat from the carbon, and that it would be more economical to carburise with gas than with solid materials. This view has been substantially endorsed by the latest most successful practice.

Strains are produced by hammering, rolling and wire drawing, or by slow or rapid cooling from an elevated temperature. Long-continued hammering and vibration will produce crystals. Hence the necessity for the adoption of some means to prevent this.

Compression, at a temperature, where true molecular flow takes place, increases the density, and in every way improves the product molecularly.

The re-working and compression toughen the plate, decrease the tendency to brittleness, and restore the fine grain of the metal, which becomes crystallised during the long period the plate is undergoing the carburisation treatment and by reason of the high temperature employed. The re-working further has the effect of closing pipes, blow-holes, and fissures, that may have originally existed as minor defects, and have developed into injurious ones during the process of carburisation.

In other words, the molecular structure impaired or damaged by the cementation is restored or repaired, the density is increased, crystallisation broken up, elastic strength increased, and the product made tenacious, tough and hard.

That these conclusions may not be accepted as theories only, I am glad to be able to present the following reports of tests of re-forged armour manufactured by the Carnegie Steel Company, and of gas-hardened plates manufactured by Mr. Krupp.

"BALLISTIC TEST OF 'IOWA'S' SIDE ARMOUR-PLATE.

"On September 4th, 1895, at Indian Head, Md., the 'Iowa's' 14-inch side armour ballistic plate was tested. The plate was mounted on backing, and a structure representing a section of the ship's side. The 10-inch B.L.R., with Carpenter armour-piercing shell, weighing 500 lbs. each, were used in the test.

This plate was press-forged, under a Whitworth press, to 17 inches, carburised and reforged to 14 inches.

"The left-hand end of the plate as mounted was the bottom end with reference to the ingot. The first point of impact was taken at a point about 10 inches above the line of the bevel, and about 2 feet to the left of the middle of the plate. The shots were fired through the screens; the striking velocity as measured was 1,482 f.s., the contract velocity being 1,472 f.s. The shell broke up on the plate, leaving the point embedded in the face of the plate to a depth of about 3½ inches; there were no cracks. The second point of impact was taken about 8 inches above the bevel line, and 29 inches to the left of the first point of impact. This distance should have been 35 inches, but as the plate showed no disposition to crack, the shot was placed nearer. The velocity on this round was 1,856 f.s., the contract velocity being 1,859 f.s. The shell broke, leaving the ogival, much distorted, buried to a depth of about 9 inches in the plate. There were no cracks. The plate thus passed the contract test with a large margin to spare.

"The third round was fired with the 12-inch B.L.R. A Wheeler-Sterling shell, weighing 850 lbs., with a striking velocity of 1,800 f.s., was used. The point of impact was taken about 30 inches to the right of the first point of impact, and about 8 inches above the bevel line. The shell broke across the forward part of the body, about two-thirds of the body of the shell being found in one piece in front of the target. The point of the shell penetrated to about the back of the plate, which was cracked across from top to bottom through this impact.

"As the contract velocity for the second shot against a 17-inch Harvey plate is 1,858 f.s., and as the additional 58 feet would not have caused this shell, although a very good one, to have perforated the plate and backing, it appears that this plate, after having stood the test of a 14-inch plate, has passed the test of a 17-inch plate. This is a better record than any other thick plate heretofore tested. The 14-inch re-forged plate, tested in February last, was perforated by a Wheeler-Sterling shell with 1,858 f.s., although it kept out a Carpenter 12-inch a.p. shell with the same velocity. This plate, therefore, although a beveled one, stood a better test than the 14-inch experimental re-forged plate of last February.

"A fourth round was fired at this plate later, the point of impact being taken on the right-hand portion. A Wheeler-Sterling 13-inch a.p. shell, weighing 1,100 lbs., was fired with a striking velocity of 1,800 f.s. The shell perforated the plate, backing, and structure, and was recovered unbroken. The plate was comparatively but little cracked." (See Plate 3.)

The excellent resistance of this plate will be better understood if you recall that the second, or higher velocity shot, for an 18-inch Harvey plate, with the 13-inch gun, requires a velocity of 1,810 f.s.

These tests justify the conclusion that the forging after carbonisation, as practised by the Carnegie Company, benefits very materially the body of the plate, while at the same time it does not appear to impair the efficiency of the carbonised surface.

The target structure for this test was built to represent a section of the battle-ship "Iowa" as actually constructed. The object was to study the effect of the impact of heavy projectiles at striking service-velocities on the framing when protected by the best armour ever made.

You will note that the 13-inch projectile (an exceptionally good one) was the only one that seriously damaged the framing.

This is a very strong endorsement of the opinion I have so often expressed, that we must not reduce the calibres of our heavy ordnance. On the contrary, for naval batteries especially we should increase the calibre and elastic strength and use nitro—high velocity—powders in shorter guns. If we cannot find a powder that will not cut out our bores, build guns in four or five pieces and so assemble their parts that you can re-tube them on board ship; it will be much easier to do this than to find a suitable powder.

Krupp's gas-hardened 11·81-inch nickel-steel plates, tested in March last with 8·264-inch, 11·02-inch, and 12-inch armour-piercers, at velocities ranging from 1,752 f.s. to 2,240 f.s., certainly afforded remarkable results.

The absence of serious cracks after such a tremendous battering testifies to the great value of the methods now employed by Carnegie and Krupp—processes containing fewer objectionable features than the so-called Harvey.

A novelty in armour was tested at the U.S. Naval Proving Ground, October 15th, 1895. It was a type proposed by Mr. D'Humy, and consisted of thin slabs placed edgewise—it was 6 inches thick and was tested with a 6-inch projectile. The first shot completely demolished the plate, the projectile breaking up at the same time.

Before closing, I wish to present to the Institution a 6-inch Wheeler-Sterling armour-piercer that has perforated 7 inches of nickel steel Harvey armour; and a sample of Leonard smokeless powder, which gave in a 5-inch B.L.R. a muzzle velocity of 3,235 f.s., with a pressure of 65,000 lbs. per square inch. As it was manufactured in 1893, it has at least been stable for a period of two years.

I must now thank you for your patience and attention, and trust the many details, so hastily passed before your eyes, will leave a favourable impression of what we have commenced to do in supplying ourselves with modern war material.

[The paper was illustrated with 375 specially-prepared lantern views, thoroughly explaining the opinions and comparisons presented by the lecturer.]

Captain ORDE BROWNE (Retired, late R.A.): Might I ask what was the velocity with which that Wheeler-Sterling shell was fired, and the thickness of the plate at which it was fired?

Captain JAQUES: It was a 7-inch nickel steel plate. That shell did not go through the carburised plate. The 6-inch projectile had a striking velocity of 1,700 f.s.

Captain ORDE BROWNE: Do you consider, supposing the result of treating a 6-inch plate is to keep out a 6-inch projectile, that that plate is successful?

Captain JAQUES: The United States, with the exception of Mr. Krupp, who has attained equally good results, have made the best nickel steel that I am aware of, and these projectiles have perforated 7 inches of nickel steel. The penetration is $1\frac{1}{6}$, that is, $1\frac{1}{6}$ untreated is the specification.

Captain ORDE BROWNE: The statement is that you consider that a good-treated 6-inch plate in the United States would keep out a good 6-inch Holtzer projectile.

Captain JAQUES: I know it.

Captain ORDE BROWNE: We cannot compare with other nations, because we have not got that particular kind of projectile.

Captain JAQUES: The 6-inch Holtzers have no effect on the best 6-inch carburised nickel steel plates in the States.

Mr. HADFIELD: I am from Sheffield, and therefore I think perhaps I ought to say something on this matter. I am sure we thank Captain Jaques very much for his interesting lecture, though it is one we might have followed much better if we had had it in pamphlet form, so that we might have compared the results. Captain Jaques refers to the penetration of Harveyized plates. I do not know whether the members here would be interested in this, but about fifteen months ago Sir William White made some tests with our projectiles with the shape of the heads slightly altered, and I am glad to say an English-made projectile of 6-inch calibre and 1,840 feet velocity penetrated a 6-inch Harveyized plate. The projectile was broken, and I believe that was almost the first time it has been done in this country. I do not know what has been done in the United States beyond what Captain Jaques mentioned, but I think it very desirable that one point with regard to the Harveyized plate should be cleared up. So many of these plates vary, that one cannot say that a projectile is of exceedingly good quality and does exceedingly good work without having some idea of the condition of the plate that it is fired against. I may also say that some years ago we fired one of our 6-inch projectiles through a 9-inch compound plate, and it remained uninjured. It was put again into the gun and fired again, and again penetrated without being broken. The third time it was fired against a 9-inch compound plate treated by Harvey's in the same way, carburised and hardened, and it then broke up. I think that was a somewhat remarkable result. I do not know whether Captain Jaques has any reports of the Wheeler-Sterling trials; if so, I shall be very glad to get them. We all know that the Americans make very excellent projectiles, and I have seen a number of them in the Chicago Exhibition. With reference to the tests of the Government here, I may say they will not accept projectiles without penetrating a $1\frac{1}{2}$-calibre plate, so that our English test is more severe than your $1\frac{1}{4}$ American test. We have supplied projectiles which have stood that test—mild steel. In speaking of compound plates, although in the excellent illustrations which Captain Jaques has put before us we have seen some very unfavourable results, still I think compound plates may give good results. Entirely uniform compound plates are very difficult to pierce sometimes. We had a trial some six months ago in which the face of the compound plates on which our projectile was fired contained no less than 1·6 per cent. of manganese to ·9 of carbon. I think that is an exceedingly severe test. I am glad to say that our projectiles successfully penetrated plates

of that description. I should very much like to have a little more information as to the quality of the plate at which this projectile was fired which Captain Jaques has mentioned to-day.

Captain JAQUES: I should be very happy to see the Wheeler-Sterling shell re-capped and fired again. I should like to take exception to Mr. Hadfield's statement that the British test for shells is more severe than ours. You fire at mild steel, and we fire at nickel steel. I think the test of 1½-calibre against mild steel is not equal to 1½ of nickel steel, which is used in America. Mr. Hadfield knows that there is no one who, I think, in the United States, gives more consideration to this shell in the manner of its production than I have done. I carried on tests at Bethlehem with a great deal of confidence as to the very remarkable toughening quality of Mr. Hadfield's manganese products. I have answered with regard to the tests of the shell.

Captain ORDE BROWNE: There is just one point on that. The shell is allowed to go to pieces in the English test. Is it allowed to go all to pieces in the American?

Captain JAQUES: It is not.

Captain ORDE BROWNE: It may come out in bits as it likes in the English test.

Captain JAQUES: This shell was a Wheeler-Sterling 6-inch armour-piercer. It perforated a 7-inch nickel armour plate, the striking velocity being 1,700 f.s.

Mr. HADFIELD: Have you any idea what was the proportion of carbon?

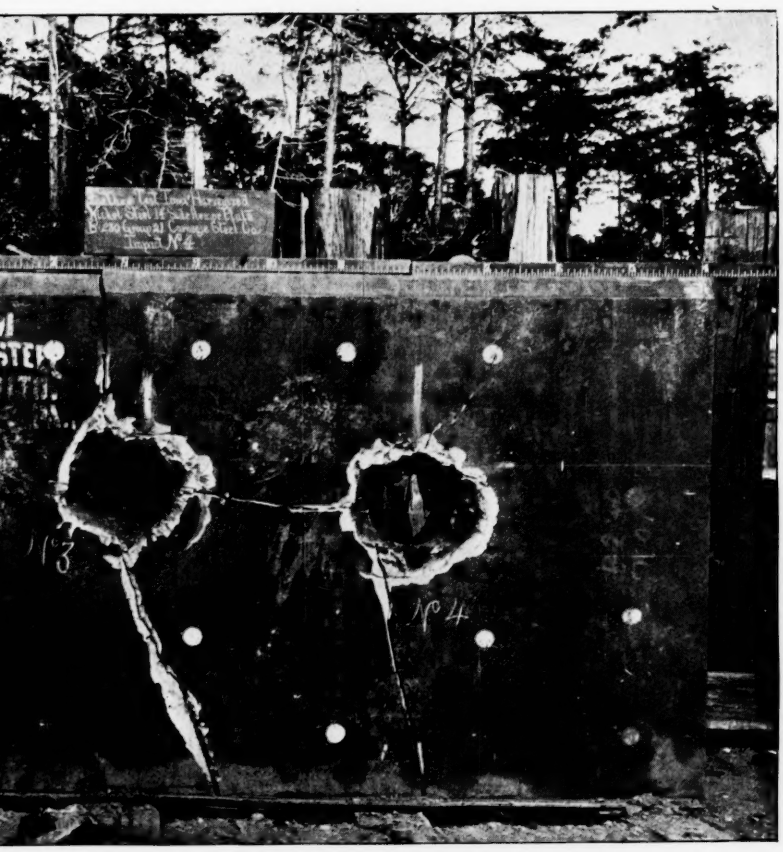
Captain JAQUES: The carbon was about 3·1 and 3·2 nickel, oil-hardened.

The CHAIRMAN (Vice-Admiral Colomb): Well, gentlemen, if there are no further remarks or questions to be asked, as the lecturer has answered the questions which have been put, it becomes my pleasing duty to offer on your behalf a vote of thanks to Captain Jaques for his most interesting paper—a paper a little too interesting for a man like myself, because the rapidity of the passages of thought through my brain had a certain tendency to confuse it, but no doubt to those who are familiar with the subjects dealt with that would not occur. It seems that the gist of the paper really turns upon the construction of shell, and whether it is more advantageous that a carburised plate should be also alloyed with nickel in preparation. I understand our rejection of nickel says nothing to the advantage, or rather disadvantage, of the alloy, but it is simply that resistance sufficiently good is got from hardened ordinary steel, and that the extra cost of the nickel is not thought worth incurring. I believe that is the condition of things. I have never heard the lecturer's position disputed as to the extreme value of nickel steel. But, gentlemen, the chief sensation that I derived from listening to the lecture was seeing the enormous advance which the United States is making in these directions. I hope that our rivalry may stop short at manufacture. As long as we both stick thus to the manufacture on our own sides of the water, we shall get on very well; but if we should venture to carry our rivalry further than manufacture perhaps it would not be quite so satisfactory. I am sure you will all join with me in heartily thanking the lecturer for the paper he has given to us.

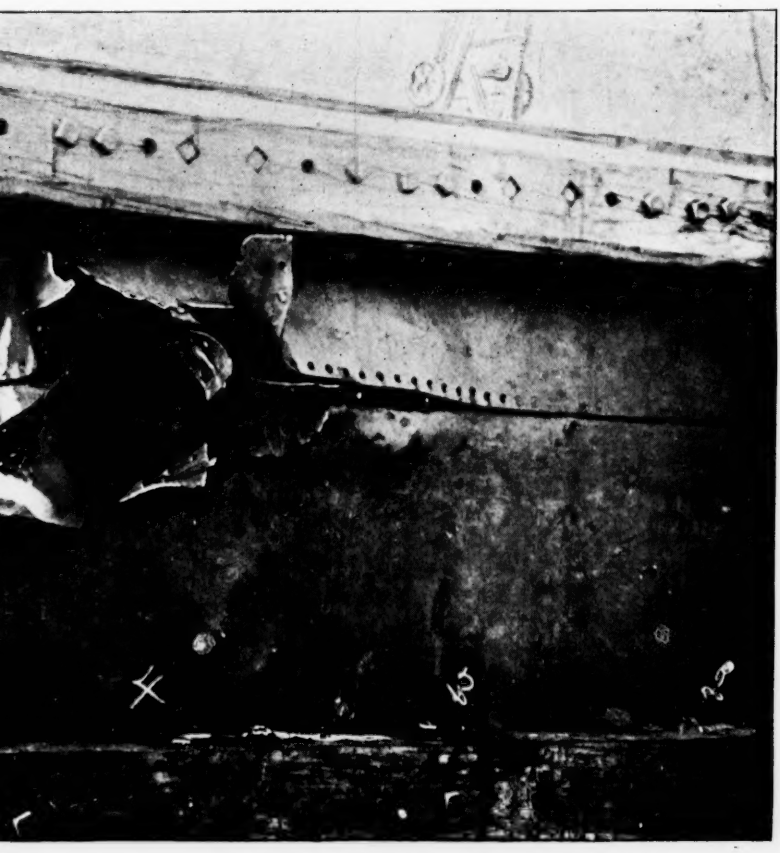
Captain JAQUES: Mr. Chairman and Gentlemen,—I thank you for your appreciative acceptance of my paper, and Captain Browne and Mr. Hadfield for their complimentary consideration and criticism. All tests are made under such different conditions in the various countries that it is only by such impartial and complete comparison as that employed in the Annapolis armour trials of 1890 that final and absolute conclusions can be reached. I think a careful examination and comparison of the British and United States requirements for shell will show that a projectile which perforates *unbroken* an oil-hardened steel plate, of a thickness equal to 1½ the calibre of the projectile, is superior to one that is broken up in getting through a soft steel plate (such as is used in England) of 1½ the calibre.

Carnegie double-forged 14-in. nickel-steel Harvey
by two 500-lb. Carpenter, one 850-lb.

13-in. 1,100-lb. Wheeler-Sterling Projectile, recove
Harvey special refined plate



teel Harvey plate for U.S. battle-ship "Iowa," after being fired at
ne 850-lb. and one 1,100-lb. Wheeler-Sterling Projectiles.



ctile, recovered practically uninjured after penetrating 14-in. nickel-steel
efined plate, and 24-in. wood backing and framing.

My estimate of British compound armour is so well known that I need express no surprise to hear that a Hadfield shell twice perforated a compound plate. There can be no possible doubt, however, as to the superiority of the Wheeler-Sterling shell which I presented to the Institution, and I have no doubt the Sterling Steel Company would gladly join me in the desire to see it fired again either at compound armour or a soft steel plate. We all know the excellence of the shells that Mr. Hadfield has produced, and he will admit that no one, either here or in the United States, has been more friendly to his methods than I. In conclusion, I will suggest that the simplest way to decide the supremacy of British or American armour and projectiles is to make a thorough competitive test in England, and I am sure that the Carnegie Steel Company and Sterling Steel Company are quite ready to enter the field. I am still more certain that *nickel* steel cemented plates will show much greater resistance than simple steel Harveyized. I have only to say I shall be very glad to answer any questions in writing, if any of you desire to communicate with me through the Secretary of this Institution.

OCCASIONAL PAPER.

NAVAL ASPECTS OF THE CHINA-JAPAN WAR.

By Vice-Admiral the Honourable Sir E. R. FREMANTLE, K.C.B., C.M.G.

This article has already appeared in the American magazine *The Forum*, and is republished here by permission, with some additions, including a comparison of force at Yalu and plans of the action. E. R. FREMANTLE.

IS there anything to be learned from the recent war between China and Japan? This is a question which I have frequently been asked since my return to England last July, and the matters on which I am most usually questioned are as to the relative value of ironclads, fast cruisers, Q.F. guns, torpedoes, and modern naval implements of warfare generally. Public attention is directed mainly to the technical points at issue, which it was naturally hoped would receive illustration from the action of well-equipped fleets representing the newest developments of naval warfare. In speaking of "well-equipped" fleets, I am only referring generally to the fact of the ships of both Powers being fairly up to date, though on the Chinese side there was much to be desired in points of detail. There was, however, no such broad distinction between the material of the fleets of China and Japan as to invalidate the lessons to be drawn from actual naval conflict; yet from this point of view the naval operations are singularly barren of results, and the reasons for this must be looked for elsewhere.

What, then, are the lessons of the war? The principal lesson is obviously a moral one, and it lies deep in the traditions and temperaments of the two nations. The warlike, go-ahead Japanese have won all along the line; while the peaceable, conservative Chinese have disastrously failed to make any respectable defence of their hearths and homes. I leave to others the task of developing this theme as fully as it deserves, my object in this article being rather to deal with facts than to dwell on the causes of the war or the characteristics of the two nations. But the differences to which I have alluded must be constantly borne in mind as the most important factor in the whole problem of how it was that the 400,000,000 Chinese could make no head against the 40,000,000 "Wojen" (dwarfs)—the term by which the Chinese insolently described their Japanese conquerors.

Though it is not my task to deal fully with the important point here raised, it needs more than a passing mention; and I cannot leave the subject without some further remarks. It is as true now as in former ages, that, if a nation is to attain to power or to retain it, it must not only

be as "the strong man armed," but it must inculcate in its citizens the manly virtues of patriotism, loyalty, and heroism. Though Bacon tells us that "no nation need expect to be great unless it makes the study of arms its principal honour and occupation," this axiom has not received general acceptance of recent years. In England, in the British Colonies, and to some extent in America, it became the fashion some years since to talk of wars as improbable, to eulogise the theoretical merits of arbitration, and to advocate the substitution of a cosmopolitan altruism for Old World patriotism. In England, the peace-at-any-price party and the Cobden school urged that energies should be directed to the arts of peace and money-making; and though recent events in America and Europe have shown that wars are still the last arguments not only of kings, but of peoples, the teachings of the free-trade league still remain with us as pious opinions to be accepted, at least in theory.

The Chinese, though they knew nothing of Cobden, have acted consistently on these principles, and have afforded us an object-lesson of the value of the theory. It is true that after the French War in 1883-84 they erected batteries on their coast-line, bought ships in Europe, and even built a few in their own dockyards, where their arsenals were improved so as to be equal to the supply of heavy guns and modern arms of precision; but these activities were mainly for show, to impress the foreigner; and the mandarins and *literati* who rule the country thought that nothing further was required. That any attention should be given to the adaptation of these war materials to war seemed to them unnecessary, and was not appreciated by the all-predominant civilian element. War, in the opinion of the ruling classes, was a most improbable event, and the war training of both officers and men was ignored, or was conducted in the most perfunctory manner. The examinations for officers in the army still, as from time immemorial, consisted in firing from a bow on horseback and in lifting heavy weights, while the greater number of their soldiers were still armed with bows and arrows, and with huge spears resembling pitchforks. Their main trust, even in the recent war, was in the heavy "gingall," a brass-piece held on the shoulders of two men, and firing a ball of about half-a-pound weight. That this should be possible while their arsenals at Kiangnan, Nanking, or Tientsin were capable of turning out 4·7-inch Q.F. guns, Maxims, improved Lee-Metford and other rifles in use in modern armies, shows clearly that no attempt had been made to grasp the meaning of modern warfare. "Villainous salt-petre" and other modern substitutes had to be acknowledged as necessary evils, but the mandarins shut their eyes to them as far as they could, and it would probably be enough, they thought, to show the hated foreigner that they could construct weapons as good as theirs—a sort of modern version of the "quaker guns" of the Bogue Forts in our first China War.

Nor was this view confined to civilians. I remember an intelligent Chinese naval officer saying to me in English "that it was a very foolish war." A very philosophical view, no doubt, and I agreed that all wars are "foolish"; but the sentiment is scarcely one that we should expect to hear from a naval officer, fostered in the warlike virtues of devotion to his

profession and country, and whose heart's desire ought to be that he should be afforded the opportunity which only war can give of showing that the honour of his country is safe in his hands.

I have spoken of the mandarin as being hopelessly ignorant of war, and I propose to illustrate this by two examples. In the middle of the war, when the Japanese had crossed the Yalu, defeating the Chinese General Sung in several engagements, with Port Arthur about to fall, and when even Shan-hai-kwan, only 120 miles from Peking, was threatened, it was evident, even to the mandarins composing the Tsung-li-Yamen, that "something must be done," and the first step was to find a capable general. In this emergency it would be supposed that they would have endeavoured to select a man in the prime of life, with at least some knowledge of war as conducted by foreigners, attaching to his staff men like General[1] von Hanneken, with other foreign officers; but this would have been common sense, and consequently it was not the Chinese view. Von Hanneken, an able military officer who had served in the German Army, had been indeed appointed as assistant to Admiral Ting, and he did yeoman's service in the "Ting Yuen" at the Yalu fight, though he was naturally ignorant of naval matters. Later, about a month before the fall of Wei-Hai-Wei, Ting had another assistant in the person of Admiral[1] McClure, a Scotch tug-captain; but throughout the war it seems to have been impossible for the Chinese mind to grasp the simple fact of the necessity for expert training so pithily expressed in the old adage of "the cobbler to his last." But this digression is interesting only as showing that even when the Chinese did condescend to employ foreigners they placed them in positions for which they were not fitted by previous training. In the case now under consideration, the man selected to be the saviour of his country must, they thought, be a Chinaman of high rank, and he was found in the Viceroy of Nanking, Liu-kun-yi, a mandarin of mandarins about seventy years of age, a confirmed opium-smoker, and so infirm that he was incapable of ascending a staircase. Conscious of his physical incapacity, and of his absolute ignorance of war, he attempted to decline the honour thrust upon him; but the appointment had been approved by the Emperor's "vermilion pencil," and the Viceroy had perforce to accept the responsibility, though he took care not to go within a hundred miles of the front. But my readers will say, "This is too absurd; surely the Tsung-li-Yamen must have had some reason for the appointment?" They are right, the reason is to be found in the fact that Liu-kun-yi was a Hunan man, and the Hunanese are universally credited in China with being a fighting race, though their reputation is founded rather on their turbulence, and on their invincible hostility to the "foreign devils," than on any proved courage in the field.

Let us look at another case. On the removal of Liu-kun-yi from Nanking his place was filled by Chang-Chi-Tung, the Viceroy of Hupei and Hunan, a man of quite a different stamp. Now Chang-Chi-Tung is

[1] I have in all cases given the nominal rank of foreign officers serving in the Chinese service.

a remarkable man, an accomplished Chinese scholar, and though bordering on sixty years of age, he is still full of energy. He has endeavoured at great expense to establish iron and steel works at Hanyang near Hankow, to turn out his own small arms, to make iron and steel rails, to work his own iron mines, coal mines, and cotton mills, and he aims at making a railroad between Hankow and Peking, for which he has obtained the Imperial sanction. One may reasonably doubt how far his far-reaching and ambitious plans are likely to succeed, but hater of foreigners as he is supposed to be, and though his aim is to do everything possible by Chinese for Chinese, yet he has recognised the necessity for having Europeans to assist him in his works, and if his money holds out he may yet do much. When added to this, he has the reputation so rare in China of scrupulous honesty, one might fairly suppose that here at least we should find a man who would take some reasonable steps to defend that part of the unwieldy Chinese Empire committed to his charge.

But what was the result of all his energy, his honesty, and his genuine love of country? He visited the Forts at Woosung, it is true, and he did take steps to get foreigners to report on some of those in the Yangtse; but his very guard were a rabble armed with all sorts of weapons, and his conception of the probable mode of the expected Japanese attack was shown by his directing the English captain of a tug in which he was embarked to go to a certain part of the Yangtsekiang, where his books told him that the Japanese had landed 600 years previously. This idea he adhered to, in spite of charts and modern information, till the nose of the tug was run into the mud, and it was clear that the bed of the river had so changed as to make landing there impracticable.

I have said enough, and more than enough, to prove the absolute ignorance of warfare shown by the Chinese. Of generals and admirals in the modern sense they had none, and the necessity for experts in war was deliberately ignored. I am inclined to think that the view of the accomplished Chinese mandarin is, that war is a dirty business, in which only the worst characters should take part, and that the most noted swashbuckler and rowdy is the general.

A remark has often been made to me that the Chinese defence against the Japanese was far feebler than that made against Great Britain and France in former wars. Various reasons can be given for this, one being that the greater complication of modern weapons necessitates a higher training in those using them; but it is also remarkable with reference to the warlike virtues, to point out that these were to some extent fostered by the universal piracy formerly prevailing on the coast of China, which was entirely put down some thirty years ago, and that the stubborn resistance shown to the French in Tongking, and more recently to the Japanese in South Formosa, has come from the piratical "Black Flags" of the Red River.

It is true that even in the Western States the professional soldier or sailor dates from comparatively recent times, but in the middle ages and up to the time of Queen Elizabeth, every able-bodied man was trained to

manly exercises and to the use of arms; but this forms no part of a Chinese mandarin's education, and would be looked upon as derogatory. Foreign instructors in Chinese naval colleges have told me that it was a far harder task to get their pupils to take part in gymnastic or calisthenic exercises than to attain proficiency in scientific knowledge.

This, then, being the Chinese view, how are we to account for the fact that undoubtedly the Chinese had made some progress in modern armament and equipment? Their army generally, as I have shown, was no doubt inefficient; there was no cohesion between the various branches of which it was composed; and it may be doubted whether the Chinese could ever be said to have had an army at all in the modern sense. Yet there was a drilled body supposed to consist of 30,000 men, though probably really numbering about 15,000, who were well armed with Krupp guns and magazine rifles; while in the Pei Yang or Northern Squadron, which had been trained by Captain Lang, a British naval officer, it was known that they had a naval force of modern ships, built in England or Germany, which cruised much at sea, visiting Japan and Singapore, and, so far as outward appearances went, formed an efficient fighting squadron. What became of the trained soldiers above alluded to was always a mystery. Some, at least, went down with the unfortunate "Kowshing" on the 25th of July, 1894, while many of the Krupp guns were captured at Ping Yang on the 16th of September; but either the number of trained soldiers was much exaggerated, or a large proportion were kept in reserve in the vicinity of the Viceroy's Yamen at Tientsin, which would be quite in accordance with the half-hearted way in which the Chinese are accustomed to conduct warlike operations.

In speaking of their navy, I have alluded to the Pei Yang Squadron as being apparently efficient, and here I must explain that there were other squadrons under various viceroys—the Nanyang or Nanking Squadron, the Foo-chow and Canton Squadrons; but the weakness of the central government was such that there was no cohesion between the forces paid for by the viceroys of the different provinces of the empire, and only an odd ship or two from any of the three squadrons referred to ever took part in the war. In fact they were never supposed to be more than show ships, *sans valeur sérieuse*, to adopt the expressive French phrase. This could not be said of the Pei Yang Squadron. It is true that Captain Lang had been got rid of by a cabal some three years previous to the outbreak of the war, and there were sinister rumours of a rapid deterioration in discipline[1] since his guiding hand had been withdrawn, while no one believed that the necessary stores and reserves were kept up. Still they were well navigated; they kept station fairly when in company; they fired well at a mark, both with guns and torpedoes; they exchanged semaphores with each other in

[1] A story, for the truth of which I cannot vouch, was current in the clubs at Hong-Kong and Shanghai, that, a short time after "Admiral" Lang's dismissal, an Englishman going on board the "Ting Yuen" unexpectedly, found the admiral playing "fan-tan" with the sentry over his cabin door.

English[1]; and they were certainly not a "negligible quantity." That they were lacking in other ways admits of no question. Officers had allowances to enable them to supply various stores, and thus the canker of peculation and dishonesty had eaten deep into the vitals of the efficiency of the squadron. There was little zeal, no real *esprit de corps*, and the most successful captain was the man who could make most money. Of Admiral Ting,[2] who commanded the Pei Yang Squadron, I would speak with respectful sympathy. He was a gallant, patriotic man, but he had been a cavalry soldier, who had taken to sea service in middle age; and deficient as he was in technical knowledge, he was much in the hands of Commodore Lew-po-chin,[2] his flag-captain in the "Ting Yuen."

The credit for such efficiency as the Pei Yang Squadron and the foreign drilled troops possessed is entirely due to one man, the famous Viceroy of Chihli, Li Hung Chang, undoubtedly the foremost if not the only statesman in China. He has a world-wide reputation, and has been called the "Chinese Bismarck." I do not propose to describe him, but his manly presence and hearty shake of the hand show that he is no mere mandarin, while, in spite of his more than seventy years, he has still a fund of energy sufficient to enable him to make laborious inspections of his troops and ships, as he did in May, 1894, two months before the outbreak of war. This war has to some extent discredited him; he is probably not free from the vice to which old men are supposed to be especially liable; and it is certain that many deficiencies and failures in munitions of war were directly due to the determination to exact "squeezes" from those nearly related to him, while no doubt his military knowledge was small. But he had no delusions on the subject of China's military power; he knew the hollowness of all the seeming show; and I feel certain that he was always anxious for peace. In 1884 he arranged the treaty of peace with France; in 1885, when war was imminent with Japan, he sacrificed much in the interests of peace, though the treaty he then made with Count Ito proved to have in it the seeds of the recent war; and I am convinced that he would have given way at all points and have averted the war had he been entirely master of the situation. In the negotiations for peace, held between Li Hung Chang and Count Ito at Shimonoseki in April last, he is reported to have said to the latter: "What you have done for Japan I wanted to imitate in China. Had you been in my place, you would know the unspeakable difficulties met with in China." He was here alluding not only to war preparations, and everyone who knows the "unspeakable difficulties" of carrying out any reforms in China will sympathise with this "Grand old man," and

[1] During the attack on Wei-Hai-Wei, our signalmen used often to "take in" semaphores made from the signal station on Liu-kung tau Island. I remember, during one of the long-range bombardments of the Japanese against the Eastern Forts on the Island, a signal being reported to me, "Send ten Nos. 1 from Western batteries to relieve those in Eastern Fort. Officers coming off duty to report at the Admiral's Yamen."

[2] After making terms with Admiral Ito for the surrender of the remaining ships and the Island of Liu-kung-tau, both these officers committed suicide.

in view of the attacks which have been made upon him by foreigners, as well as by his own countrymen, he may fairly echo Anthony's well-known complaint of the forgetfulness of men's good actions and the remembrance of their supposed shortcomings.

I have dwelt long on China's corruption, on her unpreparedness for war, and the incapacity shown by her rulers to appreciate modern warfare, as it is the crux of the problem. Let us now turn to Japan, and the contrast is enormous. In China, as we have seen, peace and the arts of peace are held up as models, while war and the heroic virtues are habitually ignored. In Japan, on the contrary, while art is held in high esteem, and the industry and enterprise of people lead them to be active traders and producers, it is the warlike virtues of patriotism, and devotion to death for a cause, which alone are deemed worthy of public recognition. That everything should give way to this and domestic affection, nay, even ordinary morality—is the accepted creed, if we may judge by that popular Japanese legend of "the forty-seven Ronans," whose graves may be seen in Tokyo to this day, decked with "votos" from fervent Japanese admirers. The story should be read to be appreciated. It relates the heroic conduct of the forty-seven "Ronans," or retainers, in avenging the murder of their Daimio by a rival—the stratagems and deceits necessary to accomplish the object in view being represented as not only excusable, but commendable.

Japan has been so much written about, that I feel that it is unnecessary for me to say more about this quick-witted, courteous, and patriotic people. That they are as warlike as the Chinese are the reverse, I have endeavoured to show, and when once they had been coerced or persuaded to open their country to foreigners, they proceeded to organise their navy and army on European models, availing themselves of the best European instructors, and proving themselves to be apt pupils. Captain Ingles of the British Navy, who for many years was their naval adviser,[1] had expressed his opinion, long before the war, that the Japanese Navy was fully up to the European standard; and similar reports had been made by distinguished military officers concerning their army. Few can now doubt that for some three years before the war broke out they had been preparing for it in their usual silent, systematic manner, and when the Tonghak rebellion gave rise to the Corean imbroglio they were fully prepared for action.

Were they anxious to "flesh the spears" of their new navy and army *à la* Cetewayo?—or was the war mainly due to political exigencies of home politics?—or were they simply drawn into the war by the evident leaning of the Corean monarch and people toward China, to the exclusion of Japanese influence? All these may have had their effect, but to one who was in Japan at the time it was no secret that the Japanese to a man were as anxious for war as their opponents were to avert it; and though it might be a pious opinion, to be held by the Japanese, that on the 25th of July, 1894, the Chinese cruiser "Tsi Yuen" had the temerity to fire the first shot

[1] Captain Ingles only left Japan about a year before the war broke out.

against a very superior Japanese force, it is so contrary to nature that on this point at least we must be permitted to believe the Chinese version of the collision which practically began the war.

Well, the war broke out, as we have seen, with the engagement above referred to: the Chinese ships being the "Tsi Yuen"[1] and "Kwang Yih," a torpedo-cruiser of 1,600 tons; and the Japanese First Squadron consisting of the "Yoshino," flying the flag of Rear-Admiral Tsuboi, the "Akitsushima," "Naniwa," and "Takachiho." The Chinese ships had left Yasan that morning, and the Japanese ships were the advanced squadron of Admiral Ito's fleet making for Chemulpho. In this engagement the "Kwang Yih" was driven ashore and destroyed; the "Tsi Yuen," though inferior in speed and force to all the four Japanese ships, escaping to Wei-Hai-Wei much damaged. It was a few hours after this that the Chinese gun-boat "Tsao Kiang" was captured, and the British transport "Kowshing" with General von Hanneken and picked Chinese troops on board, was sunk by the "Naniwa," Captain (now Rear-Admiral) Togo, after what Admiral Ito, in a recent address delivered at Tokyo, terms "several hours of useless parleyings."

For obvious reasons I am precluded from touching on the legal aspect of the sinking of the "Kowshing," which has, it appears to me, only afforded a fresh instance of the want of cohesion in the bundle of sticks which goes by the name of "international law," of which it may be reasonable to say, in St. Paul's words, that, though all things may be lawful, all things may not be expedient. As regards the manner in which it was done I cannot forbear pointing out that though forty-four Chinese were taken off the masts of the sunken vessel by the French gun-boat "Lion" on the morning following her destruction, neither here, nor at Yasan, Yalu, or Wei-Hai-Wei was, so far as I heard, a single Chinese life saved by their Japanese opponents; so that, kindly and amiable as the latter are by nature, they have much to learn as regards common humanity in war. Contrast this with numerous instances of humanity in British naval history, notably on the occasion of the sinking of the "Vengeur" on the 1st of June, of the blowing-up of the "Orient" at Aboukir, or Nelson's prayer before Trafalgar, that "humanity after victory might be the predominant feature of the British fleet."

The war then began in earnest with the sinking of the "Kowshing," and the attack on the Chinese camp at Yasan which immediately followed. I must leave the military operations to others, but it will now be advisable to make a general comparison of the naval forces of the two Powers. They were not unequal. On paper, indeed, the Chinese were superior in number and tonnage; but this assumed that the Chinese auxiliary squadrons were available and efficient, which I have shown not to be the case; and for all practical purposes the Japanese were the more powerful and better able to command the sea. The Japanese knew that they would have to do with the Pei Yang Squadron, and they had gauged it at its

[1] For size and armament of "Tsi Yuen" and Japanese ships see list of ships engaged at Yalu.

true value. It is unnecessary to go into details showing the entire nominal force of the two Powers, which would, as I have shown, be misleading; and I give accordingly a statement of the ships present at the Yalu battle, which will afford a fairly satisfactory basis for comparison.

The list of ships engaged is given correctly in the *Century Magazine* for August last by Commander Philo McGiffin, who was on board the "Chen Yuen" during the action, and I repeat it here with a few alterations. Both sides had practically all their available force present, the Chinese auxiliary squadrons remained in their respective provinces, and the Japanese had numerous small vessels and corvettes of slow speed attending on their army and keeping up communications.

Let us now examine the material force of the two fleets,[1] and for the moment take no note of the *moral*. In tonnage, in number of men,[2] in Q.F. guns, and above all in speed, and the more modern type of their ships, the Japanese fleet under Vice-Admiral Ito was superior. It was also more homogeneous, as, omitting the "Akagi," the ships varied in size only from 2,200 to 4,200 tons, and were more modern. In all these respects the Chinese fleet was inferior, but it had one advantage in two second-class battle-ships, the "Ting Yuen" and "Chen Yuen," of 7,400 tons; but the next in size were the "King Yuen" and "Lai Yuen,"—weak ships, though nominally "armoured cruisers" of 2,900 tons; and when we come to the last three ships we find that they were mere sloops or torpedo-vessels of 1,300 tons. It might well have puzzled a more experienced sailor than Admiral Ting to manœuvre such an odd lot of ships together. But we are not now considering the Yalu battle, to which I shall again refer, though I have taken the ships engaged in it as sufficient for a comparison of the two fleets.

Clearly the Japanese considered that they could successfully command the sea, and in no war has the "influence of sea power," so admirably worked out in Captain Mahan's able volumes, been more distinctly shown. "*A quoi peut servir une marine*"? asks the French Admiral Jurien de la Gravière. His reply to his question is, "*A occuper les grandes voies maritimes*"; and, to quote Bacon again, "He who has command of the sea can take as much or as little of the war as he pleases." The Japanese, having determined to turn the Chinese out of Corea, required the command of the sea to enable their troops to be brought across from Japan, and to maintain them when there; but had they been defeated by land, they could then have re-embarked their troops and have taken "as little of the war as they pleased," assuming that they retained their naval superiority.

The sea was also the shortest route for the Chinese, as we have seen in the case of the "Kowshing"; but after the war broke out they were unwilling to risk their fleet, and, until the landing of troops at Takushan,

[1] See Tables at end of paper.

[2] I have been unable to ascertain the correct number of men in the Chinese ships; but many of them were short of their complement.

which brought on the Yalu fight on the 17th of September, they accepted the serious disadvantage of having to send their troops into Corea by the long land route.

Was the whole advantage of sea power, however, fully understood in either country? This seems doubtful, as in the early part of the war the Japanese fleet was mainly employed in convoying troops; while the Chinese, although cruising freely in the Gulf of Pechili, were said to be under orders not to cruise to the Eastward of a line drawn from the Shantung promontory to the Yalu. In both countries the naval force seems to have been used in subordination to the military requirements and for secondary purposes—a misapprehension of sea power which, as Captain Mahan shows, was too frequently the bane of the French navies in their wars with Great Britain. This is a question of strategy not entirely in the hands of the naval commander-in-chief, and one must hesitate to make Vice-Admiral Ito, who in other respects showed himself to be a most able commander, responsible for it; but in his lecture, to which I have before referred, he appears to accept the *rôle* as the natural one.

It is possible that the Japanese were aware of the orders given to the Chinese ships, and that they did not wish to force a naval action till they had secured their military bases; but the policy would have been a dangerous one in the face of an active enemy; and, well supplied as they were with fast cruisers—such as the "Yoshino," "Naniwa," "Takachiho," "Chiyoda," and others—the neglect to keep touch with the Chinese fleet argues a failure to appreciate sea power in its true aspects. As a matter of fact, the Chinese fleet, even after the Yalu battle, was so far left unwatched that Admiral Ting remained at Port Arthur a fortnight after the landing of the Japanese troops at Pitzewo on the 24th of October for the purpose of attacking the fortress, Admiral Ito being content to cruise for the protection of his transports, and allowing the Chinese squadron to proceed unmolested to Wei-Hai-Wei. It is clear that there was no attempt here at blockade, or even masking, though the two fleets were within seventy miles of each other for at least a fortnight, and it would have been easy to have sealed the Chinese ships up in Port Arthur, where they could have done little or nothing for the defence of the place, and where they must have been taken when the position fell.

On the 10th of August, again, at the beginning of the war, Admiral Ito appeared off Wei-Hai-Wei with a fleet of twenty-two ships in all, and exchanged a few shots with the batteries: but the Chinese squadron was not in the port, nor I believe at Port Arthur, so that it was naturally expected that the Japanese admiral would have endeavoured to find his opponents and bring them to action—Port Arthur and Wei-Hai-Wei being the only fortified harbours the Chinese had in the North; but he was content to proceed South the next day, leaving Admiral Ting free to cruise as he pleased, and Chinese transports to cross the Gulf of Pechili without risk of capture. Ting was, I believe, off the Yalu at the time to which I refer, and it would certainly have simplified matters for the Japanese had the naval action taken place, say on the 11th of August,

with similar results to that of the 17th of September, more than a month later.

I have now dealt with the naval strategy of the war, and I have endeavoured to show that the Japanese did not make full use of their naval predominance ; and I now turn to their tactics, which were admirable in all cases. The way in which Marshal Yamagata's force was convoyed to Chemulpho by Admiral Ito, with his look-out ships and advanced squadron covering the main body of the fleet, which was concentrated in readiness to repel any hostile attack, showed a full appreciation of the necessities of the case; while at Pitzewo, before the attack on Port Arthur, and at Yung Ching Bay, when attacking Wei-Hai-Wei, the systematic cruising to prevent surprise, and in the latter case to keep touch with the enemy, which was done in great part by torpedo-boats, showed that the Japanese had little to learn from older navies. The torpedo-boat cruising off Wei-Hai-Wei in January and February, with the thermometer often little above zero, and with frequent gales, was first-rate ; the officers and men showing wonderful spirit as well as good seamanship in carrying out this most trying service. I doubt if any European navy could have done it as well. In other respects, too, the Japanese Navy showed how thoroughly the problems of modern naval requirements had been mastered. The ships kept wonderfully efficient, being attended by their colliers, hospital and ammunition ships, and "nurses" for the torpedo-boats ; the coaling being carried on almost continuously, when at anchor, by their own boats, which carried the coal in grass bags containing about half a hundredweight each. The landing of the troops was carried on mainly by sampans, and by coolies admirably organised ; the navy remaining prepared for service, an inshore squadron only assisting with steamboats.

But now to return to the naval battle off the Yalu. The very accurate account of the battle given (in the *Century Magazine* for August, 1895), by Commander McGiffin, a former American naval officer, makes it unnecessary for me to give it in detail ; and Captain Mahan's remarks in the same magazine are so much to the point that I need only refer to a few circumstances, and to the matters on which I have been so frequently questioned, as set forth in the opening paragraph of this article.

Let us look at the tactics of the two admirals. The Chinese fleet, which had been at anchor when the Japanese were sighted, immediately weighed and attempted to adopt a fighting formation said to have been advocated by Captain Lang. It consisted in the ships acting in pairs in quarter line, the fleet thus forming a sort of indented line abreast; but it would be more properly described technically as "sub-divisions (of two ships) in quarter-line in line abreast," the leaders of sub-divisions being only two cables apart. In arranging the pairs, sister-ships worked together : thus the "Ting Yuen" and "Chen Yuen" formed a pair; the "Chao Yung" and "Yang Wei" formed another pair; and so on. The arrangement has much to recommend it, but it essentially demands specially well-trained officers accustomed to manœuvre in this formation,

Under the circumstances it was a fatal error. As a matter of fact the formation was never completed, and if it was right to station the two big ships in the centre, it was certainly wrong to put the two weakest, the "Chao Yung" and the "Yang Wei," as wing ships. These latter were tailing astern, as were others, so that to the approaching Japanese the Chinese appeared to be formed in a wedge or V shape, as shown in the plan.

The Chinese formation being as above, the Japanese attack was delivered in line ahead, and Captain Mahan justly criticises both admirals—the Chinese for having placed his weakest ships on the wings, and the Japanese for moving diagonally across the front of the enemy to pass around his right wing. But though this might be dangerous against a well-drilled squadron of equal force, we must remember that to Ito the Chinese appeared to be formed in a sort of wedge, and he reasonably trusted to the better speed of his ships and to the unwieldy formation of his enemy to avert ill effects. Like Nelson's at Trafalgar, the formation might not be theoretically perfect, but it was sufficiently good to lead up to victory, and perhaps after all was practically the best under the circumstances. In the lecture before referred to, Admiral Ito says :—

"I ordered the First Squadron[1] to attack the right wing of the enemy, and then to come in upon his rear, utilising for this purpose the great speed of the First Squadron."

He then states how by this attack the "Chao Yung" was quickly disabled and set on fire, and that Admiral Ting "concentrated his chief attack upon my Principal Squadron. I managed to keep as far away from him as possible, with a view to attacking him from both sides—front and rear—when the First Squadron got astern of him."

This fully explains the intention of the Japanese admiral, who decided to take advantage of his better speed to give full effect to his strength in Q.F. guns.

I may here remark that though the nominal speed of the Japanese ships only averaged some 3 knots more than that of the Chinese squadron, owing to their being newer and better cared for, I have reason to believe that 5 knots would more fairly represent the real difference, the "Chao Yung" and "Yang Wei," for instance—nominally 16-knot ships—being incapable of steaming more than 7 knots. Practically, after the first collision, the Chinese lost all order, and contented themselves with a vain endeavour to keep bows on to their enemy—an impossible problem, which the advocates of bow-fire *quand même* should note. The Japanese, on the other hand, were always under control, and manœuvred effectually together in compliance with signal. Indeed, it was not till the two Chinese ironclads were left alone, that the latter seem to have recovered any initiative, and the only wonder is that the Japanese did not succeed in destroying the whole of the rest of the squadron.

[1] Consisting of the fast cruisers "Yoshino," "Naniwa," "Takachiho," and "Akitsushima."

Before leaving the Yalu battle, I should like to refer to some instances of special gallantry on both sides. On the Chinese side the captain of the "Chih Yuen" is stated to have fought his ship with great determination: she was pushed forward toward the Japanese fleet in an attempt to ram, and was sunk by a storm of shot, though she continued firing to the last. The "Lai Yuen," on fire so badly that the whole of her after part was literally burned out, was saved by the gallantry of her first lieutenant and brought to Port Arthur. It is stated that the captain proposed to run the ship ashore, but that the first lieutenant, who was down at the fire, persisted that it could be got under, and owing to his noble example this was eventually done.

In the Japanese squadron all seem to have behaved well. The "Hiyei" and little "Akagi," having been left behind owing to their slow speed, were practically cut off from the remainder of their fleet, and had to run the gauntlet through the whole of the Chinese fleet, narrowly escaping destruction. Both ships were so much damaged as to be put out of action, the "Akagi" having her captain killed and her foremast shot away. The most notable instance of heroism, however, is stated to have occurred in the "Matsushima." A shell from the "Chen Yuen" had exploded three of the heavy charges for the 13-inch gun, which had imprudently been allowed to accumulate in an exposed position, causing a loss of fifty killed and wounded, and there was imminent danger of the ship being blown up. It is stated that this would have happened but for the heroism of a petty officer stationed in the handing-room, who with great presence of mind instantly closed the door of the magazine, placing his back against it. It is satisfactory to hear that this man's life was saved, though he was badly burned.

I do not propose to follow the Yalu battle further. The Japanese only destroyed the four ships, "King Yuen," "Chih Yuen," "Chao Yung," and "Yang Wei,"—the "Kwan Chia" being wrecked the same night off Talienwhan Bay; and the two Chinese ironclads made such a good defence that toward nightfall Admiral Ito withdrew. But the victory was complete. It was like Flodden,

> "When skilful Surrey's sage commands
> Led back from strife his shattered bands.
> . . . . . .
> Then did their loss his foemen know,"

and from the 17th of September the Pei Yang fleet, as a fighting squadron capable of meeting the Japanese fleet on equal terms, had ceased to exist. It might still be a "fleet in being," but so crushed and humiliated, as well as reduced in numbers, as to be of little value.

The obvious lessons to be drawn from the fight are as follows:—

1. The necessity for keeping a fleet under command.
2. The advantage of the offensive.
3. The advantage of speed.
4. The advantage of Q.F. guns.

5. The necessity of special precautions against fire, and of removing all woodwork.
6. The uselessness (or worse) of thin screens or shields to guns.
7. The necessity for not having accumulations of heavy-gun charges in exposed positions.

On the two last points only is it necessary to make any remarks. As regards the sixth lesson, the conclusion is drawn rather from the action of the 25th of July, and from the attack on Wei-Hai-Wei, than from the Yalu battle. On the 25th of July the shield of the "Tsi Yuen's" starboard 8-inch gun was struck by a shot, causing some loss to the gun's crew, and sending a shower of splinters across the deck, which killed or wounded nearly the whole crew of the opposite gun of similar calibre. As the result of this experience the Chinese had landed all their gun-shields before the Yalu fight. The second instance is one drawn from Wei-Hai-Wei, when a shot from the Chinese batteries struck the shield of a machine-gun of the "Yoshino," causing a loss of two killed and seven wounded, none of whom would have been touched but for the protecting (?) shield.

With reference to the seventh lesson, the danger of the accumulation of powder is not a new one, and, as Captain Mahan argues, it is probably better to run some risk of explosion than for ammunition to be unavailable at a critical period; but there is no answer to the case of the "Matsushima," where, as I have mentioned, but for the heroism of a petty officer, the ship would probably have been blown up.

On the above points there can be little difference of opinion; but there are others more debatable, such as the relative value of belts *versus* deck-plating. On this point constructors may remark with satisfaction that, if we except the "Saikio Maru" transport, no ship in either fleet had her motive power or steering-gear injured. It is also clear that the forty-five Japanese Q.F. guns practically got the better of the eight protected heavy guns in the Chinese ironclads. On the other hand, it is claimed that the loss of life in the latter was comparatively small, and that their plating was never pierced by the Japanese projectiles, even though struck several times by the 13-inch guns of the "Matsushima" and her two sisters. It must be remembered, too, that the Japanese cruisers represented the most modern development of their class, whereas the Chinese ironclads were thirteen years old, and their guns were not of the newest pattern or supplied with a sufficient number of common shell,[1] so that the Yalu battle leaves the great question of armour protection and of cruisers *versus* ironclads much where it was.

What, then, of torpedoes? The Japanese certainly never fired any, and never intentionally closed to within fair torpedo range. The Chinese ships fired two or three, but, as I gathered, rather to get rid of them in

[1] I think it was Commander McGiffin who said, referring to the scarcity of common shell for the 12-inch guns of the "Chen Yuen," that when one came up from the shell-room during the action, "they nursed that shell, sir, like hothouse plant."

view of the danger of their being struck by a shot than with any expectation of damaging the enemy. I think we may say, then, that the Yalu battle has proved that at least in a general action above-water torpedo discharges are useless.

I now leave the Yalu battle, and I have only space for a few lines on the lessons to be derived from the operations which ended in the capture of Wei-Hai-Wei. These are not numerous, and they convey nothing new to us. It is evident that a mere passive defence is useless, and generally the Chinese ships refrained from offensive action and became helpless as the net closed around them. It is probable that after the mainland batteries had fallen into the Japanese hands their fleet might have entered the harbour and taken the Chinese ships, demoralised as they were; but no doubt possible submarine mines acted as a deterrent, and Admiral Ito might well feel that his prey could not escape him.

As to the successful torpedo attacks made by the Japanese, by which the "Ting Yuen," "Lai Yuen," and "Wei Yuen"[1] were destroyed, whilst appreciating fully the dash and gallantry of the Japanese officers, as well as their splendid devotion and seamanship to which I have already alluded, we must remember that one end of the boom defending the harbour was in Japanese hands, and that the Chinese ships were huddled together as close under the island of Liu-kung-tau as possible, to escape from the fire of the Japanese batteries, making no attempt to defend themselves by an inner boom or other obstructions. The boats accordingly had every advantage, and no doubt the Chinese, as usual, were "surprised" at the attack being delivered from the South-West when they knew that the Japanese torpedo-boats must enter the bay, in which they were lying, from the East. Still the first attack was a failure, the boats being spitted on the boom, and in the first successful attack one boat got a shot through her boiler, and one was wrecked, though subsequently got off again.

One episode of Wei-Hai-Wei deserves a passing notice. On the 31st of January the Japanese carried all the Eastern Chinese forts on the mainland, and as the attempts of the Chinese to blow up the batteries or to disable the guns had been only partially successful, the majority of the guns were serviceable, and, the forts being manned by seamen gunners from the fleet, the guns were quickly turned on the Chinese ships and the batteries on the island. Seeing this, the "Ting Yuen" got under weigh that afternoon, and, taking up a position so as partially to enfilade them, she attacked two of the forts armed with 21 and 24 centimetre Krupp guns. The attempt was gallantly made, and one gun at least had its muzzle shot off by the ironclad's gunners; but an inspection of the fort—a fine modern one built under von Hanneken's superintendence—showed the practical invulnerability of modern sea forts against naval attack, though possibly they might be temporarily silenced by a storm of projectiles from Q.F. and machine guns.

[1] A lightly-armed training-ship.

In reviewing the naval operations one must constantly read between the lines, and differentiate between Japanese and Chinese; as, unless this is done, they can be made to prove anything. At Wei-Hai-Wei, for instance, we have seen the success of the Japanese torpedo-boats; but the Chinese had twelve torpedo-boats there, and they did nothing, making no attempt to harass the Japanese cruisers or to engage the fourteen Japanese boats. Their career was indeed inglorious. On the 8th of February, during a heavy bombardment of the island of Liu-kung-tau by the Japanese fleet, the twelve Chinese boats attempted to escape to the Westward, making for Chefoo. They were immediately chased by the "Yoshino" and other fast cruisers, and were all driven ashore, captured, or destroyed. With two exceptions they were old boats, which certainly could not steam 15 knots; probably 12 would be nearer the mark.

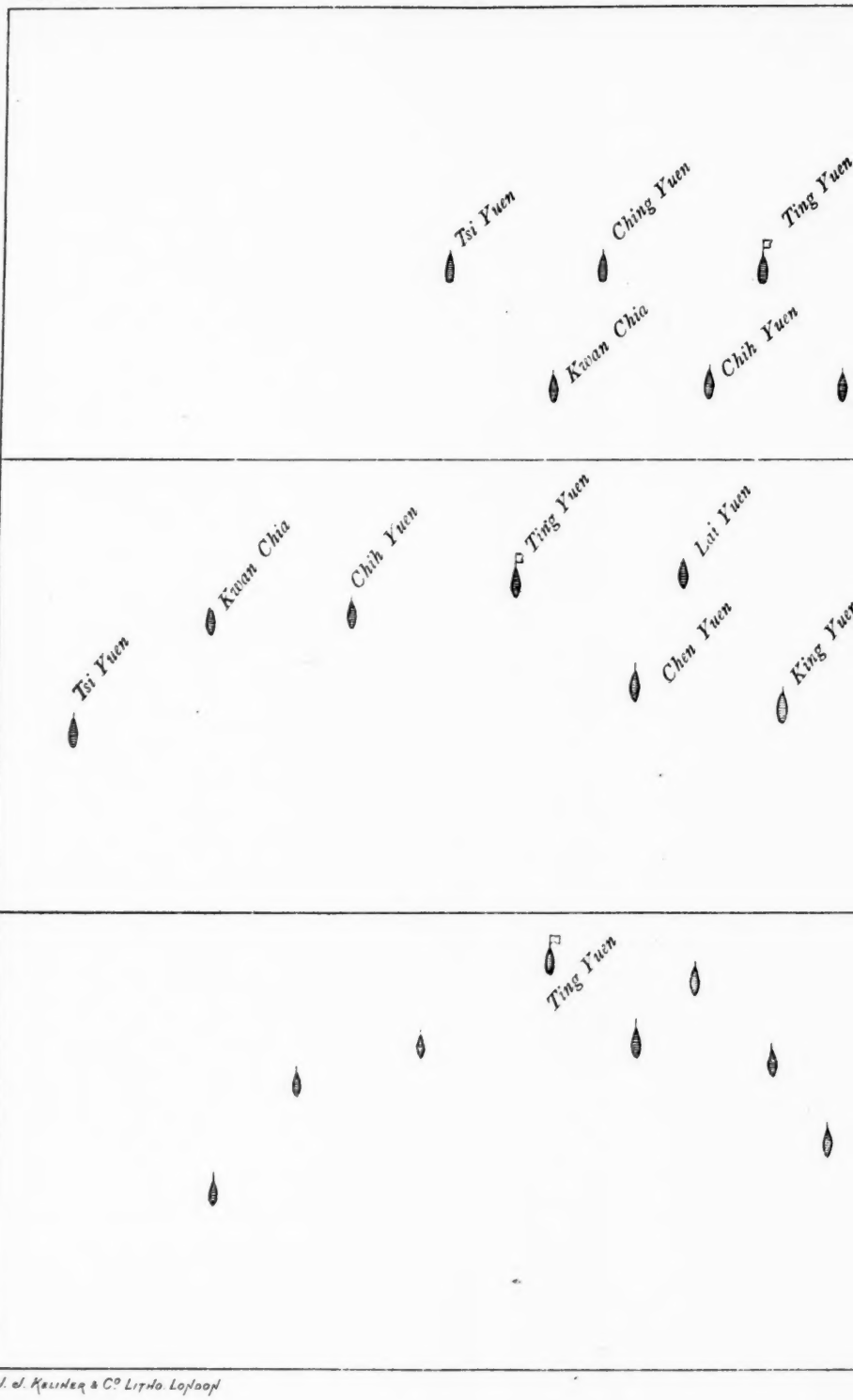
I began this article with the question as to whether there was anything to be learned from the war which I have been considering, and I have endeavoured to answer it; but, as I proceeded, I have become more and more impressed with what an old, old story it is. A nation imbued with courage, skill, and national spirit has triumphed over one which lacked those qualities, trusting to half measures and blind chance; each individual, with rare exceptions, being mainly intent only on saving his own life and his individual interests. Nevertheless, several instances, even in this war, have shown that the Chinese, when well led, are not wanting in courage, and with good organisation they may yet become formidable.

From the naval point of view one is struck with the fact of the eternity of general principles in strategy, and even in tactics, modern appliances notwithstanding; and only shallow observers will fail to see the lessons which can be learned from the campaigns of a Nelson, a Rodney, or a Suffren, if care is taken to adapt them to the circumstances of our own times.

In reviewing the naval operations one must constantly read between the lines, and differentiate between Japanese and Chinese; as, unless this is done, they can be made to prove anything. At Wei-Hai-Wei, for instance, we have seen the success of the Japanese torpedo-boats; but the Chinese had twelve torpedo-boats there, and they did nothing, making no attempt to harass the Japanese cruisers or to engage the fourteen Japanese boats. Their career was indeed inglorious. On the 8th of February, during a heavy bombardment of the island of Liu-kung-tau by the Japanese fleet, the twelve Chinese boats attempted to escape to the Westward, making for Chefoo. They were immediately chased by the "Yoshino" and other fast cruisers, and were all driven ashore, captured, or destroyed. With two exceptions they were old boats, which certainly could not steam 15 knots; probably 12 would be nearer the mark.

I began this article with the question as to whether there was anything to be learned from the war which I have been considering, and I have endeavoured to answer it; but, as I proceeded, I have become more and more impressed with what an old, old story it is. A nation imbued with courage, skill, and national spirit has triumphed over one which lacked those qualities, trusting to half measures and blind chance; each individual, with rare exceptions, being mainly intent only on saving his own life and his individual interests. Nevertheless, several instances, even in this war, have shown that the Chinese, when well led, are not wanting in courage, and with good organisation they may yet become formidable.

From the naval point of view one is struck with the fact of the eternity of general principles in strategy, and even in tactics, modern appliances notwithstanding; and only shallow observers will fail to see the lessons which can be learned from the campaigns of a Nelson, a Rodney, or a Suffren, if care is taken to adapt them to the circumstances of our own times.



J. J. Kelliher & Co. Litho. London

PLATE I.
Chinese formation as intended.

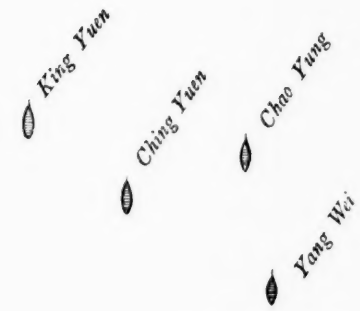


PLATE II.
Chinese formation as actually existing when action commenced.

PLATE III.
Chinese formation as it appeared to the Japanese.

Battle-sh
Armoure
Cruisers—
Do.
Armoured
Torpedo-
Gun-boat
Torpedo-
Cruisers—
Armoured
Cruisers—
Battle-shi
Armoured
Gun-vesse
Armoured

Plate 4

intended.

existing
ed.

ppeared to

Classification.	Shi
Battle-ships—2nd Class ...	Ting Chen
Armoured-cruisers	Lai Yu King
Cruisers–3rd Class, protected	Tsi Yu Chi Yu Ching
Do. Do. unprotected	Chao Yang Kwan
Armoured-cruiser	*Ping Y
Torpedo-vessel	*Kwang
Gun-boats	*Epsilo *Kappa
Torpedo-boats—1st Class...	*Foo Lu *Tyo Ji

Classification.	Shi
Cruisers—2nd Class, protected	Matsus Itsukus Hasida
Armoured-cruiser	Chiyod
Cruisers—2nd Class, protected	Yoshin Naniwa Takach Akitsus
Battle-ship—3rd Class	Fuso
Armoured-cruiser	Hi-Yei
Gun-vessel...	Akagi
Armoured-transport	*Sakio M

* Partially engaged afte

CHINESE SQUADRON AT YALU.

	Ships' Names.	Date of Launch.	Displacement.	Armour (in inches). On Belt.	Armour (in inches). On Turret Barbette, or Battery.	Speed.	Guns.	Torpedo Discharges.
	Ting Yuen	1881	7430	14	12	14·5	Four 12-in., two 6-in., two 4-in. (Four 6-pdr., two 3-pdr.) Q.F. 8-M.	3
	Chen Yeun	1882						
	Lai Yuen	1887	2850	9½	8	15	Two 8¼-in., two 6-in., 8-M.	4
	King Yuen							
d-	Tsi Yuen	1883	2355	0	6	15	Two 8·4-in., one 6-in., 10-M.	4
d-	Chi Yuen	1886	2300	0	0	18	Three 8·4-in., two 6-in., 16-M.	4
	Ching Yuen							
d-	Chao Yung	1881	1350	0	0	16	Two 10-in., four 40-pdr., 7-M.	0
	Yang Wei							
	Kwan Chia	1887	1300	0	0	16·5	Three 4·7-in. Q.F., three 6-pdr. Q.F., 4-M.	0
...	*Ping Yuen	1888	2850	8	5	12	One 12 in., two 6-in., 8-M.	4
...	*Kwang Ping	1889	1030	0	Hull partly of wood.	16·5	Three 4·7-in. Q.F., two 6-pdr. Q.F., 4-M.	4
	*Epsilon	1879	440	0	0	10	One 11-in. M.L., 2-L., 4-M.	0
	*Kappa	1881						
	*Foo Lung	1886	120	0	0	24	Two 3-pdr. Q.F.	2
	*Tyo Jih	1887	90	0	0	23	Two 3-pdr. Q.F.	3

* Ships that took little part, having been anchored in shore.

JAPANESE SQUADRON AT YALU.

	Ships' Names.	Date of Launch.	Displacement.	Armour (in inches). On Belt.	Armour (in inches). On Turret Barbette, or Battery.	Speed.	Guns.	Torpedo Discharges.
	Matsushima	1890	4277	0	12	17·5	†One 13-in.; twelve 5-in. Q.F., fifteen 3-pdr. and 2½-pdr. Q.F.	4
d-	Itsukushima	1889						
	Hasidate	1891						
..	Chiyoda	1890	2450	4½	0	19	Ten 5-in. Q.F., fourteen 3-pdr. Q.F., and 3-M.	3
	Yoshino	1892	4150	0	0	23	Four 6-in., eight 5-in., twenty-two 3-pdr., all Q.F.	5
d-	Naniwa	1885	3650	0	0	18·7	Two 10-in., six 6 in.; two 6-pdr. Q.F., and 12-M.	4
	Takachiho							
	Akitsushima	1892	3150	0	0	19	Four 6-in., six 5-in., six 3-pdr., all Q.F.	4
.	Fuso	1877	3718	7	9	13	Four 9½-in., two 7-in. 8-M.	0
.	Hi-Yei	1878	2200	4½	Hull Composite.	13	Three 7-in., six 6-in., 8-M.	0
.	Akagi	1889	615	0	0	12	One 9½-in., one 6-in.; six 3-pdr. Q.F.	0
.	*Sakio Maru	1888	2913	0	0	14	Four Q.F., probably 6-pdrs.	0

ngaged after the main action.

† Aft in Matsushima; forward in her two sister-ships.

OCCASIONAL PAPER.

THE EYESIGHT OF THE SOLDIER.

By Surgeon-Major H. R. WHITEHEAD, Army Medical Staff, F.R.C.S., Eng.,
Assistant Professor of Military Surgery, Army Medical School, Netley.

I.—General Considerations.

THE subject I wish to bring forward is one, not only of interest to the medical officers of the Army, but to the Service at large, and the general public.

The immense improvement in the rifle, which has taken place in recent years, has brought into greater prominence the condition of the eyesight of the man who is destined to use it.

The range and power of the present rifle, in comparison with its predecessors, have been largely increased. Has a corresponding amount of attention been paid to the vision of the soldier? And are we able by our present tests to eliminate all those who, from indifferent sight, are physically incapable of using to the best advantage this powerful weapon? If not, we have, as far as musketry is concerned, a certain proportion of men in our Service who are practically useless from this cause.

The efficiency of our soldiers as marksmen is a most vital question. In order that they may fulfil all the requirements, it is absolutely necessary that they should see clearly the object at which they aim, and judge correctly its distance, in order to enable them to sight their rifles accurately.

Much closer attention is paid in the present day to their training in this respect: not only are they practised with fixed targets, the exact range of which they know, but also with moving objects, and at marks of which they must themselves determine the distance.

It is merely a waste of time and trouble, and an unnecessary expense to the State, to attempt to train in musketry duties a soldier whose visual powers are of such a nature as to render him perfectly incapable of ever becoming thoroughly efficient.

The height, weight, chest measurement, and several other particulars, all no doubt useful in their way, are carefully noted on the Medical History Sheet of the recruit, but we do not place on record his acuteness of vision, which is a far more important point for future reference than some of these items.

This knowledge would enable us to ascertain if the vision remained unaltered during the course of his service, or whether it deteriorated. In

discussing the subject later on, we shall see that in certain errors of refraction of the eye, the tendency, under some conditions of climate, health, strain, etc., is towards rapid failure of sight.

The minimum of vision demanded by the present tests is extremely low, and the characteristics of such vision are quite incompatible with efficient military service. We have in common with other European nations made great improvements in our rifle, but we have done nothing further to ensure that the visual powers of the soldier shall be of such an order as to enable him to get the full value out of the weapon with which he has been recently armed. In many cases the great power of the rifle is simply thrown away, and for all practical purposes some men in our Army might just as well be given the old "Brown Bess."

Our Army is a comparatively small one, and therefore we should be correspondingly particular to demand full efficiency in every soldier.

It is not only in rifle practice that the soldier of the present day requires a high standard of vision, it is equally as necessary to enable him to properly perform his duties as sentry or outpost.

The duties of the signaller whether working by flags, lamp, or heliograph, call for a very high standard of vision. Not only is it necessary that he should possess full acuteness of vision, but also that the alertness of vision should be trained to a very high pitch.

It is of the utmost importance that the quality of alertness of vision should be insisted on. This cannot exist without the normal amount of visual acuteness being present. It is by this quality that a person is able to receive and appreciate an impression which may only be presented to his retina for the fraction of a second. The training of the soldier should aim at the development of this faculty by every means in our power, as a most important feature.

In discussing questions of eyesight, we must not neglect to consider the effect of various states and conditions of the atmosphere.

The quality and quantity of the illumination exercise, to a greater extent than is generally supposed, a most powerful influence on the vision in certain errors of refraction. This is particularly the case in myopia, constituting a real and serious danger, which I shall subsequently refer to in greater detail.

Let us now pass on to consider the tests for eyesight in use in the Service, and the character of vision they demand.

2. *Tests imposed by the Service and quality of Eyesight they demand.*—It is interesting to trace the evolution of the test for the eyesight of our soldiers. As I have remarked before, the adoption of weapons of greater range have brought the subject prominently forward.

Earlier in the century the regulations on the subject were very vague, and left a good deal to the recruiting medical officer, who might have very strict or lax ideas on the subject.

On the introduction of the rifle an attempt was made to secure recruits with absolute emmetropia, viz., perfect vision ; but it was soon found that men possessing this quality did not present themselves in sufficient numbers, and that the test would have to be of a less

stringent character. In 1863 a circular letter was promulgated, stating that H.R.H. the Field-Marshal Commanding-in-Chief had notified "that men should not be received into the Service who did not see well, to 600 yards at least, a black centre 3 feet in diameter on a white ground."

This, then, was taken as the basis of the test for eyesight. The next step was how to apply this readily in the case of recruits. It was obviously impossible to apply the test to each as it stood. The late Sir Thomas Longmore, who did so much in placing the tests for visual examination on a better footing, invented the test dots which are still in use. He applied the law of the equality of the visual angle, and his dots at the distance named represent the 3-foot bull's-eye at 600 yards. It was only necessary to fix some convenient distance (such as it would be practicable to obtain in every recruiting office); and he took 10 feet as the standard distance, which, as we shall afterwards explain, is not, perhaps, so good as one of 15 or 20 feet—the latter being the better distance to employ. If only 10 feet are given, the rays of light from the dots are not parallel from an ophthalmic point of view, and, therefore, the accommodation must be used on every occasion. For ophthalmic purposes rays are held to be parallel which come from 15 feet or further, and 20 feet, or 6 metres, is the distance which is always employed in testing with Snellen's distance types.

Longmore, however, no doubt guided by his knowledge of the smallness of some of the rooms used for recruiting, and the practical difficulty of advising a greater distance, preferred to take 10 feet. To obtain the size of an object equal at 10 feet to a circular bull's-eye at 600 yards a simple rule of three sum was required, and ran as follows:—

yards		feet		feet		
600	:	3	::	10	:	x,

the answer is $\frac{1}{20}$-inch. A circular dot, therefore, which has a diameter of $\frac{1}{20}$-inch at 10 feet, is seen under exactly the same visual angle as a 3-foot bull's-eye at 600 yards.

The test dots have been the official method of testing vision for some years, and are on a War Office Form (I. 1220). On the back of the test dots some very practical rules are given with regard to illumination, and other matters of equal importance. As regards illumination, we know that acuteness of vision depends largely on sufficient illumination, and that up to a certain point it increases in direct ratio to the illumination of the object. Beyond this, however, the acuteness diminishes. Landolt has pointed out a very important fact connected with the alterations of states of illumination; he has proved by experiment that it takes about 25 minutes for the eye to fully accustom itself to differences of illumination. This has a very practical application, namely, that no candidate should be kept in a dark room for some time and be then suddenly subjected to the test in a good illumination, but his eyes should first be allowed to accustom themselves to the altered state of light.

Another practical point is that it is very important to fix a definite unit of illumination of test objects. We are accustomed to speak of

acuteness of vision as 1, $\frac{1}{2}$, $\frac{1}{3}$, and so on, but are not careful to see that the amount is always estimated under exactly the same unit of illumination.

Having made ourselves acquainted with the test the recruit has to pass, I shall now pass on to consider the actual acuteness of vision this test implies.

Snellen's two laws with reference to the acuteness of vision are as follows:—

1. That non-complex objects should be seen under a visual angle of 1 minute, or $\frac{1}{60}$ of a degree.
2. That complex objects such as letters should be seen under a visual angle of 5 minutes, or $\frac{1}{12}$ of a degree.

The test dots are non-complex objects, and should, therefore, be seen, according to Snellen's scale, by people with normal acuteness of vision under a visual angle of 1 minute or $\frac{1}{60}$ of a degree.

Each dot is seen under this visual angle at 43 feet, and should, therefore, be seen by those who have full acuteness of vision at this distance. Our recruits are only obliged to see them at 10 feet, and are thus obliged to have as a minimum less than $\frac{1}{4}$ of the normal acuteness of vision. According to Longmore, supposing the average width of a man equipped for field service to be 18 inches, he would in this direction subtend an angle of one minute at 1,710 yards. If the circumstances of ground, atmosphere, etc., were favourable, such a figure would be perceived by a soldier with normal vision at this distance. If the acuteness of vision is reduced to $\frac{1}{4}$ under corresponding circumstances the figure would only be discerned at a distance of 427 yards.

Snellen was asked to incorporate these dots among his test letters and objects; this he has done. Curiously enough the No. 54 (Paris feet) appears above these dots, showing that they should be seen at this distance to come under the visual angle named. When first asked to place these dots in his test types their shape was square, to correspond to the square target then in use; when these were done away with, the dots once more were made circular, but the number 54 still remained above the dots; the square gave a greater visual angle, and should be seen at 54 feet, to constitute 1 of the acuteness of vision according to Snellen's scale, the area of the square being to the circle as 1 : ·7854.

If Snellen's types were used the type marked 24 would have to be read at 6 metres. No doubt it would be more scientific to use this type instead of the dots, and thus be able to register on the Medical History Sheet, or elsewhere, the exact acuteness of vision observed on enlistment. Unfortunately, a certain number of the men who present themselves as recruits cannot read, although this number is gradually growing less and might practically be disregarded in the present day, Snellen's E types being substituted if occasion required. We have seen from the foregoing remarks that the amount of vision required by a recruit on enlistment is less than $\frac{1}{4}$ of the normal acuteness of vision. It will be useful to discuss the character of the vision this implies. It has been found by experiment (Longmore) that men who had 1·75 dioptres of myopia could

just pass the dot test; those having 2 dioptres of myopia were excluded.

The general character of vision that a man who possesses this amount, viz., 1·75 dioptres of myopia, has, is as follows :—

He sees all objects, at a further distance than 2 or 3 feet indistinctly.

At 20 *feet* it would be impossible for him to count books on a shelf, and although he might be able to recognise a person at this distance it would be from some peculiarity of gait or figure, and not because he is able to recognise the features. Much, however, depends on the illumination, and in a bad light the sight of the myope is greatly interfered with.

At 50 *yards* groups of figures, especially against a dark background, are not easily counted.

From this distance upwards the features of a landscape are very blurred and indistinct, trees, figures, posts, etc., being indistinguishable.

At a distance of 700 *or* 800 *yards* a horseman passing against a dark background would not be recognised. Later on, in this paper, in speaking of the influence of myopia on military service, we shall see how darkness of the atmosphere from any cause interferes in the most decided way with the sight of the myope.

It is impossible as the test now stands to assert how much hypermetropia is allowed. All depends on the activity of the accommodation. This in young men who enlist at ages from 18 to 25 is very free. If the hypermetropia is latent, or in some degree latent, a very large amount may be admitted by this test. The reason will be further explained in discussing, in more detail, this error of refraction.

Errors of Refraction.—A few words explanatory of the nature of errors of refraction may not be out of place, in case there should be any readers who do not belong to the medical profession.

To understand the subject it is necessary to glance for a minute at the eye as an optical instrument. (See diagram of eye appended.)

In the eye there are three curved refractive surfaces:—1. The anterior surface of the cornea with a radius of curvature of 8 millimetres. 2. The anterior surface of the lens with a radius of curvature of 10 millimetres. 3. The posterior surface of the lens with a radius of curvature of 6 millimetres.

There are in addition three refractive media, namely:—1. The aqueous humour with an index of refraction of 1·33. 2. The lens 1·43. 3. The vitreous humour 1·33. The focus of the eye as a whole is placed at 22·2 millimetres.

A movable diaphragm is placed just in front of the lens; this as in all optical instruments only allows the more central rays to enter, and cuts off all the marginal rays. In perfect vision parallel rays of light are capable of an accurate focus on the screen or retina placed at the back of the eye. This condition is known as emmetropia. (Plate 5, Fig. 1.)

For near vision the lens is capable of greatly increased curvature, due to two factors, the power of the ciliary muscle, which relaxes the

suspensory ligaments and allows the lens to change its form, and the elasticity of the lens itself. The eye is, therefore, capable of changing its focus from distant to near objects with ease. This power, or amplitude, of accommodation is at its height at the age of ten years, after this age it steadily decreases in a ratio which is well known, till practically this inherent power ceases at about the 65th year. As I have stated, the focus of the eye in perfect vision for parallel rays is 22·2 millimetres, and the object is clearly and accurately focussed on the retina. Deviation from this perfect refraction may occur in one of two ways :—

1. The eye may be too short, or the refractive power insufficient; in either case the focus for parallel rays is behind the retina, and *hypermetropia* results. (Plate 5, Fig. 2.)
2. The eye may be too long, or the refractive power too great; then the focus for parallel rays will be in front of the retina, and the term *myopia* is given to this condition. (Plate 5, Fig. 3.)

In addition to these two simple errors, the curvature of the eye may be different in its two meridians; the term *astigmatism* is used to denote this state. Two foci are formed and the confusion on this account is very marked.

The origin of myopia and hypermetropia is quite different. Myopia is a disease which is induced in early life; in the majority of instances by the effects of straining the eyes to read small print in a bad light.

Hypermetropia is, on the other hand, essentially a congenital disease, and the result of improper development of the eye. It will thus be seen that the first disease may be considerably aggravated by a continuance of the factors which produce it; whereas hypermetropia cannot itself be aggravated, but may, and does, lead to further disease of the eyes in other ways.

The Influence of Errors of Refraction on Military Service.—The influence of these errors of refraction on military service is a very interesting subject, and one which deserves special attention. As I have stated, in the condition known as hypermetropia, the focus for parallel rays is theoretically behind the retina, but practically no focus is formed, as the eye is either too short or the refractive power too feeble. The refractive powers of the eye can be increased by the action of the ciliary muscle which relaxes the suspensory ligament, and allows the lens to become more convex. It naturally follows that in order to focus the object on the retina the ciliary muscle has constantly to be in action. This muscle, like all other muscular tissues, is liable to become fatigued, and when this happens the eye begins to feel weary and heavy, and the sight to become much worse. Any condition, therefore, which leads to fatigue of the muscular tissue of the body as a whole, or of this particular muscle, causes an apparent increase of the impairment of vision. In young subjects the tone of this muscle is great, and we meet the condition known as latent hypermetropia, in which the sight is apparently much better than is really the case. Some of the

hypermetropia may be manifest, and some latent, or it may all be either the one or the other.

The practical outcome of this is, that a recruit having a large amount of hypermetropia which is mostly of the latent character, may be able to pass on enlistment the dot test with ease. It is a well-established fact that men having comparatively a large amount of this disorder are admitted into the Service.

In the first place the presence of hypermetropia is a great bar to good shooting, as the muscular strain is very great and difficult to maintain. The consequence is that a man may take an accurate sight and get on the bull, but just as he has found the correct spot the whole target may vanish, and he is unable to fire with precision. What has really happened is that the strain on the ciliary muscle has been too long maintained, this has relaxed, and the focus on the retina has altered, the image on the retina changing from a sharp, clearly-defined picture to a blurred one.

The result of this is that the soldier knowing, from experience, what happens when he takes a long and steady aim, does not wait to do so, but fires directly he is anywhere near the spot—in fact takes a snap shot.

Every year adds to his sight difficulty. In the natural course of events the accommodatory powers grow less, and in this way all the latent hypermetropia becomes manifest and the effects more apparent. Among other causes which lead to loss of tone of the ciliary muscle, I may refer to the effects of climate. In the tropics and sub-tropical regions the heat alone has been found to cause a loss of muscular power; when to this is added the effects of ill-health, malarial fevers, and such like, it will be recognised that residence in a tropical country is very prejudicial to the subjects of this defect. To illustrate my remarks I might quote the following case: A man of twenty-three, with two years' tropical service, has a severe and prolonged attack of malarial fever; he notices after this that his sight is much impaired, and that when he attempts to read the letters run together; he states that on enlistment he easily passed the test for vision. On enquiry he acknowledges that on the range his sight has been getting worse, and that he found that he was obliged to fire directly he was on the target, or it became misty, blurred, and possibly vanished. The explanation is a simple one, he is hypermetropic, the attack of fever has for the time, at least, seriously impaired the power of the ciliary muscle, and the consequence is that he cannot exercise enough accommodation to see clearly. The strain exerted is also very likely in hypermetropia to lead to conjunctivitis and retinitis and other inflammatory conditions of the eye.

The influence exerted by myopia on military service is an extremely important question. I have already said that soldiers are allowed to enlist with 1·75 D. The tendency of this disease to increase is very great, conditions of ill-health, over-stimulation by light, strain, etc., are very apt to cause rapid impairment of the sight and severe structural disease. Clinically, the disease is divided into the simple and progressive varieties, the latter condition being of a very serious nature. The writer reported such a case in the Army Medical Department Report for 1892,

in which in $1\frac{9}{12}$ year's service the amount had increased from 1·75 D. to 4 D. The case was a most instructive one from many points.

I have previously mentioned in this article the blurring of the image caused by the rays coming to their focus in front of the retina, and drawn attention to the characteristics of the vision of a man with 1·75 D. of myopia.

Besides the consideration of the vision of a recruit with the limit of myopia in bright daylight, we have to consider the effects of alterations in the conditions of illumination, and in this lies one of the great dangers of allowing myopes of even a comparatively small degree to serve in our Army.

When the illumination is dull from any cause, or the atmosphere darkened by snow, rain, fog, smoke, etc., the sight of myopes becomes for the time very seriously impaired, and the defectiveness of their vision seems to be quite out of all proportion to the comparative smallness of the error of refraction. It is, however, at night or in the twilight that the full effects become most apparent. At such times the pupil dilates widely, allowing the marginal rays to penetrate into the eye, with the result that the diffusion rays about the image formed on the retina are greatly increased, and the image proportionately blurred. In bright sunlight the pupil contracts to a very small point, and the myope sees under the most favourable circumstances. Nearly all the marginal rays are excluded, and the image on the retina is comparatively clearly defined.

At night, or on a dull day, the possessor of a very small amount of myopia is for all practical purposes nearly blind. Could we commit the charge of an important outpost to a man with 1·75 D. of myopia, knowing the character of his vision, and the effects of certain conditions of the atmosphere on it?

In savage warfare especially, where the attack is often delivered just before the dawn, and the enemy moves with great stealth and celerity, should we feel confident that a myope of the extent we admit into the Service would observe the approach of such foes? Those who have studied the subject will readily allow that the danger of employing such men as soldiers is not at all a fanciful one. Through no fault of their own, they may be placed in such positions as almost to ensure disaster, and in which it would be a physical impossibility for them to do otherwise than fail.

On the subject of astigmatism I have but little to say, chiefly on account of the imperfect vision which a very small amount of this disorder creates, and the readiness, therefore, with which it discloses itself. Uncorrected by lenses this condition is quite a bar, if it exists to any appreciable extent, to military service. The cylinders used in the correction of such complaints are often of so complicated a nature, and require such accurate fitting, that under any circumstances this state of refraction is most undesirable.

I have shown how prejudicial to military efficiency are the results of the errors of refraction; there is another condition which requires some notice in this respect, I refer to the subject of monocular vision.

The regulations which guide us in the examination of recruits, and also of candidates for commissions, distinctly state that in the first instance the dots must be seen by the recruit with each eye separately, and in the case of candidates for commissions that a certain standard must be reached with both eyes. Therefore we exclude men from entering the Service who do not see to the required standard with each eye separately. The question, however, is often asked even by surgeons who have made this branch of the profession their study:—What is the harm of admitting a recruit or officer who is emmetropic, or nearly so, in the one eye, although he may have great impairment of vision of the other? After a consideration of the following remarks I think the reason will be perfectly plain.

Some doubt seems to exist, in the case of a trained soldier, as to his eligibility to continue in the Army after the loss of an eye. The rule laid down in W.O. Circular, No. 874, of 17th August, 1864, states definitely that a soldier shall not be discharged, if the sight of the other eye is good. This rule refers to cases of pension, apparently, and I shall try to explain why it is not desirable to act in accordance with its instructions in the present day.

The difference between binocular and monocular vision is that, in the first case, the brain recognises the length, breadth, and depth of an object, while in monocular vision only length and breadth are observed. The result is that objects appear to be nearly in the same plane, as in a photograph. The perspective is not seen, and the relative position of objects not appreciated.

Monocular vision imposes certain serious disadvantages on men in whom visual efficiency is a necessity.

Anatomatically we know that comprehensive arrangements exist for the due performance of binocular vision, and that two eyes exist, not that one may merely supplement the other in case of loss or damage of one organ, but as part of a definite plan to improve our acuteness of vision.

The disadvantages of monocular vision may be summarised as follows:—

1. Loss of power to interpret the relative positions of objects.
2. Contraction of the field of vision.
3. Decrease of acuteness of vision.
4. Decrease of alertness of vision.
5. Diminution of colour vision.

Two exclusively military disadvantages are also added, viz.:—

6. Difficulty of firing from the left shoulder if the right eye be lost or impaired.
7. Liability to catarrh of the socket if the eye has been removed.

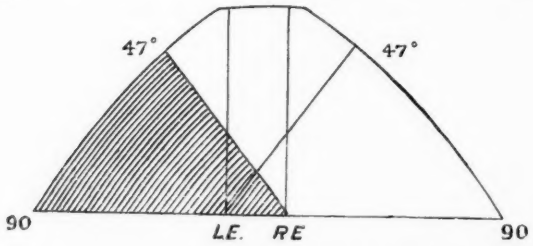
Let us examine these disadvantages more closely, and try to assess the actual disabilities they impose.

1. *Loss of power to interpret the relative position of objects.*—To be an efficient marksman it is necessary that the soldier should be able to judge distances. If he does not possess this power he cannot sight his rifle correctly, and therefore loses its full value. He judges the

distance of an object by the relative size and position of the mark to other surrounding objects. When either he or the object is shifting his or its position rapidly, he would find still greater difficulty in determining rapidly the true distance. In many other conditions of drill, ceremonial, and field duties, which it is not necessary to detail at greater length here, he would find the loss of binocular vision a very decided disadvantage.

2. *Contraction of the Field of Vision.*—We have only to consider the question for a minute to be convinced of the vital objections which exist to placing reliance on the possessors of monocular vision in positions where a high standard of vision is required. Two fields of vision exist, viz., the field of direct, and that of indirect vision. The limits and extent of these are determined by an instrument called the perimeter. The principle of this instrument is that the eye is placed in the centre of a circle, and the degrees are marked on the circumference of the circle. In the field of direct vision the head is fixed and the eye follows and must distinguish as far as possible some object, such as a letter, which is moved round the circumference of a circle. In testing the field of indirect vision, the direct vision is engaged by fixing with the eye a point in the centre of the circumference of the circle; a test object is then carried from without inwards from the periphery of the arc of the circle, and the degree and extent of perception is noted.

If the field of direct vision for each eye be taken separately, we shall find that from 10° to 15° are added when both eyes are used simultaneously. It is, however, in the field of indirect or periscopic vision that the greatest amount of contraction is present. Each eye is capable of about 90° of indirect vision in the horizontal plane on the outer side and 47° on the inner side.



If the left eye, for instance, is lost, the right eye will then have only 137° of indirect vision, instead of 180°, as there would be if both eyes were unimpaired. In other words, the contraction in the field of vision, in the horizontal plane is, in monocular vision, equal to about 43°.

To thoroughly explain the practical bearing of this question, let us take an example in military life, where a sentry is on duty in a hostile and savage country. The whole attention of a man employed on such a duty should be directed to detect the slightest movement near his post, and a timely appreciation of danger to prepare his comrades for a threatened attack. The history of our campaigns will probably suggest not a few

instances where, in spite of the most close and attentive watch, the enemy has been able to steal up to the position and deliver an unexpected assault. If such instances are common with men of presumably full visual acuteness, how much more common will they be, if a man is seriously handicapped by the loss of a considerable part of his field of vision! Supposing his attention to be directed to some object in front of his post, some 40° in the horizontal arc of his normal vision would be entirely lost to him, and he would be absolutely blind to this extent.

3. *Decrease of Acuteness of Vision.*—The decrease of acuteness of sight in monocular vision is an undoubted fact. In the present time we cannot look with indifference on any circumstance which diminishes the visual efficiency of the soldier.

4. *Decrease of Alertness of Vision.*—This function is quite different from the mere acuteness of vision, and demands especial consideration. Alertness of vision is the faculty of recognising speedily and interpreting rightly objects presented in the visual field. In normal vision this power can be very greatly increased by practice. Our sailors and soldiers should be especially trained to observe rapidly and accurately. The raising of a head for a fraction of a minute over the brow of a neighbouring hill, or the momentary gleam of a spear head may be all the warning a sentry may receive of foes near at hand, and the ability to receive and interpret aright such impressions may be of incalculable value to the force to which the man belongs.

5. *Diminution of Colour Vision.*—This does not concern military men as much as those of the sister Service. In the latter, the slightest suspicion of the loss of colour acuteness would obviously be fraught with great danger.

6. *Difficulty of firing from the left shoulder if the right eye be lost or impaired.*—With regard to this point, it is only necessary to remember that the handle of the bolt of the Lee-Metford rifle projects on the right side of the weapon, and that in bringing it up on the left side it is very apt to catch in the accoutrements.

7. *Catarrh of socket if the eye has been removed.*—As a purely surgical question this is of interest, and probably, in the present time, no soldier would be allowed to go on active service who had been obliged to have one eye removed. The dust, smoke and dirt inseparable in a campaign, with possibly limited means of cleanliness, would soon cause a tendency to this condition, and lead to non-efficiency of the individual.

Although I have spoken of monocular vision as being the result of impairment by disease or loss of an eye, it must not be forgotten that great inequality in the sight of the two eyes leads practically to the same results. One eye may be of normal acuteness and refraction, and the other very deficient in these respects. In this case, practically, all the work is done by the sound eye, unless the vision of the other eye has been fully corrected by lenses.

I have purposely avoided, as not coming within the scope of the present article, any discussion of the tests employed in the case of candi-

dates for commission in Her Majesty's Army; I may, however, incidentally remark that they are very low, and allow as much as 5·5 D. of myopia, and hypermetropia to an indefinite amount.

Conclusions.—I have attempted in this article to point out the loss of efficiency which accompanies the deviation from normal binocular vision. The character of the rifle the soldier uses we know, but do we thoroughly appreciate the way the power of this weapon may be discounted by the indifferent eyesight of the man who uses it?

Luckily for us, from a national point of view, the sight of the class from which we mostly draw our recruits is undoubtedly good, and only a minority—let us hope it is a small one—enter the Service with the minimum of vision required by the present tests.

We have decidedly made great advances in the range of our rifles, but have we insisted on a greater visual efficiency of the men who use them? We cannot answer this last question in the affirmative. We know that many men are now serving who, although they may come within the standard, are absolutely useless as marksmen, and in many of these cases the defects from which they suffer are liable to increase.

It would, of course, be a very satisfactory solution of this question to insist on the recruits possessing emmetropia. This quality of vision could no doubt be procured, if the State were willing to pay for it, by increasing the advantages of the Service, and thus obtaining a greater selection for recruiting purposes. On the present terms, I take it, some difficulty not infrequently exists in obtaining the proper numbers, and many of these men are "special" enlistments, and men of inferior physique.

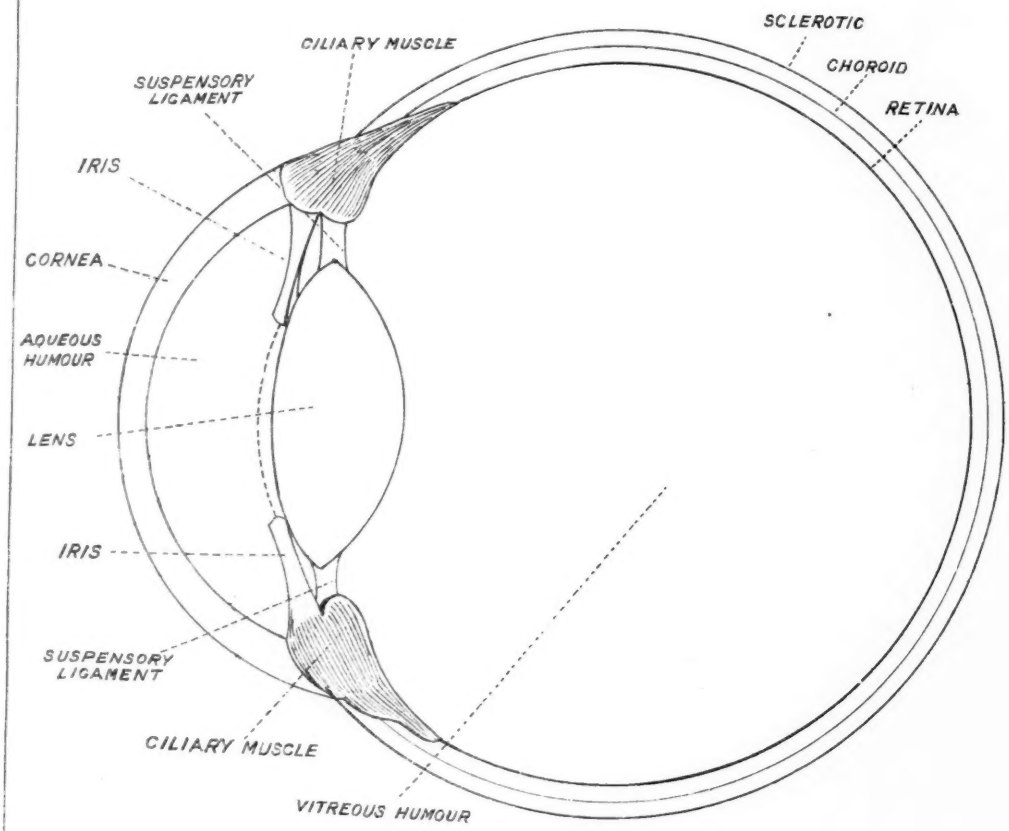
It is therefore out of the question, without increasing the cost of the Army to a great and unpractical extent, to obtain perfect vision in our soldiers.

The test as it now stands, demanding only a fourth of the normal acuteness of vision, is exceedingly low, especially when we consider what a large extent of hypermetropia this may allow, and the qualities of the vision of the myope who can pass this standard. In my opinion it is much too low. If, however, exigencies in the way of a difficulty in recruiting necessitate such a low standard, we still have a means of improving the vision of men of this stamp, namely, by proper correction of their errors of refraction by spectacles.

The use of spectacles no doubt possesses many disadvantages; they are unsightly, and many may think unsoldierlike. They are apt to get lost or broken, and to replace them in such places as Afghanistan or the wilds of Upper Burmah would need special arrangements. Damp, smoke, rain, etc., by causing temporary dimness of the lenses, still further increase their disadvantage.

On the other hand, a bad shot, who is so because he is the subject of some errors of refraction, if supplied with proper glasses would probably be converted into a good marksman. Errors of refraction which have a tendency to increase if uncorrected, would remain stationary and not lead to a permanent increase of impairment of vision when properly corrected.

DIAGRAM OF EYE SHOWING POSITION OF PRINCIPAL PARTS.



J. & J. Kellner & Co. Litho. London.

DIAGRAM SHOWING THE FOCUS FOR PARALLEL RAYS IN EMMETROPIA, MYOPIA, AND HYPERMETROPIA.

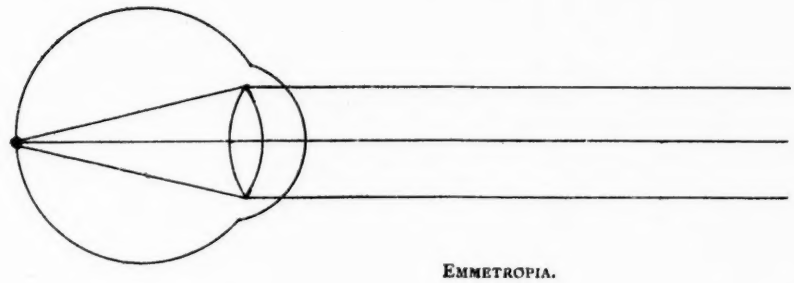


Fig. 1.

EMMETROPIA.

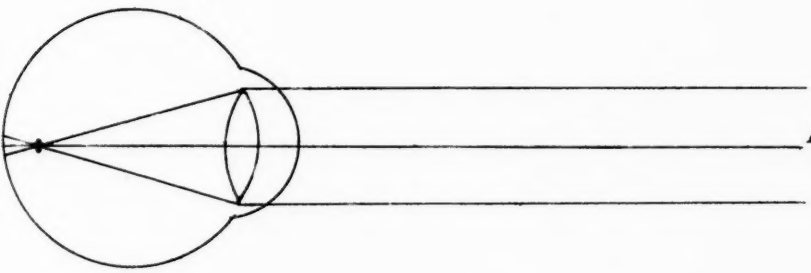


Fig. 2.

MYOPIA.

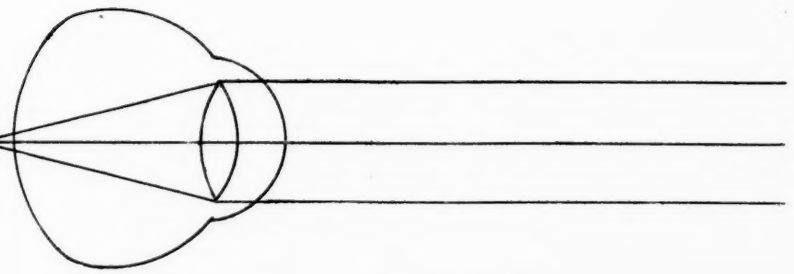


Fig 3.

HYPERMETROPIA.

The difficulties in the way of supply might easily be met, if care were taken not to allow a high degree of myopia or hypermetropia to enter the Service, and candidates showing astigmatism to any marked extent were rejected.

Spectacles are allowed in our Army at musketry. Why not increase the efficiency of the man all round, by encouraging him, if needful, to wear them always?

At Brussels, in 1875, at a meeting of the Ophthalmological Congress, there was a discussion on the use of spectacles in armies. The following conclusion, among others, was adopted:—

"The interdiction of spectacles deprives an army of many intelligent men. The Congress is of opinion that there are good reasons for admitting the use of spectacles in armies."

I have already stated that I think it would be very advantageous if the exact amount of vision with which a recruit joins the Service were stated on his Medical History Sheet. Such vague statements as "My sight has failed very much lately," etc., would easily be ascertained by an objective test. The information as to a man's sight would be very useful to the officer commanding his company. If he were shooting badly, the Medical History Sheet would at once show the character of his vision.

Snellen's test types might now easily replace the test dots; most of the recruits can read, and if they are not able to do so the letter E placed in various positions, which the recruit describes, would give the same result. His acuteness of vision would then be ascertained by Snellen's scale.

I have pointed out the disadvantages of monocular vision; this is not allowed on enlistment, and if through any cause it supervenes during service the soldier should, in my opinion, be discharged as unfit.

In conclusion, in summing up my ideas on the subject:—

I think the present test for eyesight too low, in comparison with the power of the weapon. If, however, from difficulties in recruiting a higher standard cannot be imposed, I am of opinion that the use of correcting spectacles should not only be allowed, but encouraged.

FOREIGN SECTION.

VISUAL SIGNALLING.

By Dr. Ph. FREDERIC WÄCHTER.

(Compiled from Official Sources.)

Communicated by Major A. H. BAGNOLD, R.E.

THE following somewhat literal translation of a report published in the *Miltheilungen über Gegenstände des Artillerie- und Geniewesens, G—68*, 1894, will, it is thought, be of interest to all branches of the Services, in which the art of visual signalling is so much practised.

That there are very considerable defects in the lamp signalling equipment of the British Army, is well known. The results, therefore, of the prolonged experiments in Austria are the more particularly interesting.

It will be seen from the report that the general conclusion is in favour of the use of a large spherical or quasi-parabolic mirror.

The theoretical reasons which support this conclusion are not far to seek.

It has been shown by Professor André Blondel, in his "Theory of Projectors," that the illumination produced at any given distance by any properly-constructed optical projector is, subject to the application of certain co-efficients, and neglecting the absorption of the atmosphere, equal to the product of the *intrinsic brilliancy* of the source of light and of the *area of aperture* of the projector, divided by the *square of the distance*. By the intrinsic brilliancy, is meant the candle-power per unit area of surface of the source of light.

It follows, therefore, that the actual size of the source of light does not enter into the question of the illumination produced, but only governs the dimensions of the illuminated field.

The simplest case to deal with analytically is that of a parabolic mirror, and this has been treated very clearly by M. Jean Rey, in the *Electrical Engineer*, of 13th December, 1895.

It will be easily seen by studying that article that a central cone of maximum uniform illumination is produced, and that this cone is surrounded by a luminous fringe which is of little value for signalling purposes. The same is true for all projectors, whether fitted with mirrors or lenses.

Now, the application of illuminants of high intrinsic brilliancy, such as the electric arc, the lime light or the magnesium light, to field signalling equipment has been found to be attended with considerable difficulty.

We must, therefore, be content to employ oil lamps which may

produce intrinsic brilliancies of from 10 to 30 candle-power per square inch of flame.

The electric arc light has an intrinsic brilliancy of about 116,100 candle-power per square inch, and the lime light with spirit jet as used in our Service has an intrinsic brilliancy of about 200 per square inch.

If, therefore, we are forced to use a source of light having only an intrinsic brilliancy of about 20 candle-power per square inch, it is quite obvious that a large lens or reflector must be employed.

Lenses of large size are expensive, and, moreover, they are very heavy. It follows, then, that the use of a light reflector must be resorted to.

There is every reason to believe that light and efficient reflectors of 12 or 15 inches diameter can be produced at a moderate cost, and it remains to consider what focal length is the best to employ.

In Professor Blondel's work, before quoted, it is clearly shown that, with a parabolic mirror, the largest cone of maximum illumination is produced when the focal length is 1·2 times the radius of the aperture of the mirror.

This evidently gives the best proportions for a so-called "reflector lantern."

The obscurating arrangements need special consideration, and it is regretted that Dr. Wächter has not given us some details under this head.

In any case, attempts to produce a reliable signalling lamp with an aperture of 3, 4, or 5 inches only, should be abandoned. A. H. B.

Although visual signalling, in comparison with the electric telegraph and telephone, appears to be only an imperfect and clumsy makeshift, it nevertheless possesses some peculiar advantages which, for special military purposes, make it sufficiently important and valuable to justify the subject being given a somewhat searching consideration.

The advantages consist of the following:—

1. In visual signalling one is not dependent on previously prepared connections, either above or below the ground, but one is enabled, within certain limits, to open communication between any selected points.

2. Given a practical choice of suitable stations and apparatus, only a comparatively short time is required to establish lines of communication by the process of visual signalling. A few minutes are sufficient in most cases to effect the exchange of messages at relatively very long distances (perhaps 20, 30, and even 40 kilometres).

Considering the time required to construct an electric line of 40 kilometres, it is obvious that under certain circumstances the visual telegraph can considerably excel the electric line in celerity of despatching messages.

3. The most important advantage is, however, that correspondence can be sent over the enemy's head without his being able, even should he be cognisant of the progress of the work, to prevent or disturb the operation. This point is of special importance in the connection of fortified positions. It may be urged that fortresses, as a rule, are connected by subterranean electric wires, but their detection and destruction, by

chance or treachery, is always possible, and then communication by visual signalling, as constituting a means not subject to interference by the enemy, affords the only practicable method. Again, visual signalling makes it possible to communicate from an effectually invested place with the mobile friendly army, over the heads of the investing forces, which by electric telegraph would only be possible in exceptional cases.

4. Finally, an advantage, which should not be underrated, consists in the cheapness and portability of the signalling stores.

Opposed to these advantages is the great drawback that fog renders visual signalling impossible, and that the range of the apparatus depends to a great extent on the condition of the atmosphere, on the light, and on the more or less favourable situation of the signal stations. Naturally such influences are greater in proportion to the distance, but it may be assumed that comparatively few days would occur in Central Europe on which it would not be possible to signal over a distance of at least 8 to 10 kilometres. The conditions are only unfavourable for distances of 40 to 100 kilometres, when such a clear atmosphere as seldom prevails in our surroundings is indispensable.

The various systems of visual signalling and their merits, the results of experiments of the Military Committee gained by exhaustive trials extending over several years, are considered below :—

I. *Flag Signals.*—The simplest, best, and cheapest method of visual signalling consists in the use of the white-red flags, about 1 metre square.

Two such flags, with a good telescope and a light telescope stand, form a capital signalling outfit, which renders good service in daytime for distances of from 4 to 14 kilometres, and which constitutes a portable equipment, as the total weight does not exceed 5 to 6 kilogrammes, and could, therefore, be carried comfortably by one man even up the steepest mountain top.

The method of signalling consists in the raising of flags, one flag signifying a dot, and the simultaneous raising of two flags a dash, in the Morse alphabet. With some practice the process becomes sufficiently rapid. The time required for the delivery of a message may be shortened by adopting certain preconcerted signals by waving the flags once, twice, three, or more times, which may be understood to mean "end of word," "end of message," "end of sentence," "not understood," etc., etc.

For the reception of signals, and as an invariable component of all signalling outfits, only the best and most efficient telescopes should be selected. For this purpose the telescopes of Merz, which possess a magnifying power of 28 to 30 and a field of vision of $1\frac{1}{4}°$, are to be specially recommended; with an object glass of 40 millimetres diameter sufficient clearness is assured, and the weight, with leather case, is about 1·7 kilogrammes only. The price in round figures is 40 florins.

A light, and at the same time steady, stand is a most necessary accompaniment of the telescope, because the vibration of it in the wind disturbs observation. Such a stand can be produced at an approximate cost of 20 florins. Thus the cost of a complete outfit, inclusive of two

flags, amounts to about 65 florins. If a cheaper telescope be selected, the cost may be reduced to one-half, or even one-third, but it would act prejudicially on the range, which must be determined by the quality of the telescope. It must be observed that practice in observation plays a most important *rôle*, and that the correct handling and use of a telescope have to be practised just as much as the use of a microscope or of a levelling instrument, and require to be mastered in a similar manner to any other scientific and technical apparatus, which can only be effectively used after a thorough course of practice.

Special stress is laid upon this point, because a general opinion prevails that no manner of previous practice is required in the use of a telescope, and that anybody can at once observe effectually with one, particularly if he be already accustomed to the use of binocular or field glasses. However, this view is decidedly wrong, and is most clearly refuted when, for instance, the observation of astronomical objects, say planets, is in question.

Irrespective of the fact that the quick focussing of strong magnifiers is in itself not the easiest of operations, experience teaches that a layman looking at a planet observes only a luminous circular disc, and in spite of sound eyesight and his best endeavour fails to detect such small details on the disc which the eye of the astronomer, trained by many years' practice, perceives even when Nature has favoured it less than the untrained eye of the layman. Similar phenomena appear also in optical telegraphy, when the expert recognises the signals, even under unfavourable conditions, whilst the novice is perhaps unable to find the distant station, and, having found it, fails to see that which he should see.

The varying opinions given by several individuals on the same pattern of signalling apparatus are often explained by the varying degrees of efficiency in the use of the telescope.

II. *The Optical Shutter Telegraph.*—Shutter telegraphy is effected, as a rule, by an arrangement whereby the window opening of a fort can be quickly covered or exposed by means of a shutter painted white. For this purpose the shutter must be so constructed that it is easily movable, and can be made to appear or disappear by simply pulling at the cord.

If the fort and its environs have the appearance, more or less, of a white surface as seen from the opposite station, the open window represents a dark spot on the light ground, and the window in this case disappears from view when its space is filled by the white shutter. If, on the contrary, the surroundings are very sombre, as in the case of mountain slopes with thick grass, shrubs, and trees, it is advisable that the exposed parts of the fort should be dark-coloured, and in such conditions a window opening will not stand out very clearly from the surroundings, but appears as a white spot when covered by a light-coloured shutter.

The appearance of the dark window opening or of the white shutter for a longer or shorter period (about 4 and 1 beats of marching time) signifies dashes and dots of the Morse alphabet, which by means of the telescope are read from the opposite station. In this case a telescope stand is not required, as a loop-hole with a specially prepared bed for the

instrument would be more suitable. The size of the shutters is naturally dependent on the required range. But given flags and shutters of equal dimensions, one can obtain a considerably longer range with the former, which is explained by the effect of contrast in such case. With flags, which allow of positions at selected points, it may be arranged to have as a background either the clear horizon or, in mountainous districts, the slope of a distant mountain.

In both cases the flag stands out as a dark or light object more clearly than a shutter at the same distance, and for that reason the former is visible at greater distance.

Practical experiments taught that signalling with shutters 0·8 metre wide and 1·9 metres high could only under very favourable conditions be carried out to a distance of 13 kilometres, whilst under normal conditions a range of from 4 to 6 kilometres only could be relied on.

It is needless to mention that shutters are only applicable to stationary positions, and are unfit for movable equipments.

In the past, however, a class of signalling apparatus, which took the form of a Venetian blind mounted on a wooden stand, was employed, but the results were decidedly unsatisfactory. On the other hand, shutters can be used for signalling purposes at night, when combined with the hereafter-mentioned reflector lanterns.

III. *Reflector Lanterns.*—The reflector lanterns consist of a spherical glass or metal mirror with a light at the focus. An ordinary petroleum lamp with a flat or round burner furnishes the simplest means of providing the light, and for protection against wind and weather the mirror and lamp are enclosed in a suitable lantern case. (Plate 6, Fig. 1.)

The range of such a reflector lantern increases in proportion to the area of the reflecting mirror and to the quality of the lamp.

Fig. 2 shows a reflector lantern of very simple form, as used with Ebner's signalling apparatus. The diameter of the metal mirror in this model is 30 centimetres, and the petroleum lamp, with a flat burner, has a candle-power of six and burns for six hours. Comparative trials were made with this lamp, and another to be presently described. They were found to be of approximately equal value.

Very exhaustive and numerous experiments were made with a reflector lantern fitted with a spherical concave mirror of glass (moulded and not ground), of 30 centimetres diameter and 16 centimetres focal length, and using a round burner petroleum lamp of about 15 candle-power. The light of this lantern at night was seen with the naked eye, even in a slightly hazy atmosphere, at a distance of 25 kilometres, and with the telescope a maximum range of 47 kilometres was obtained, this latter result, of course, only in a clear atmosphere, as it is impossible to see objects at that distance through even a slight haze. At times it happens that although the stations are themselves beyond the range of vision owing to fog, yet the light of a lantern, particularly when very powerful, penetrates the veil of fog and makes communication possible. This applies, however, only to a slight density of fog. The light of this lantern is also visible by day at varying distances as a yellow sparkling

point, but the range depends in a great measure on the condition of the light. Even under most unfavourable conditions, in daytime and with clear sunshine, one station being exposed to the direct rays of the sun, the light was seen at 8 kilometres distance; only an open gateway serving as a dark background. However, under better conditions signals can be given in daytime with this pattern of reflector lantern to a distance of 10 to 12 kilometres, and in a few instances experiments under a cloudy sky with a clear atmosphere resulted in a range of 25 kilometres being obtained by day.

IV. *Signalling Projectors.*—Optical signalling lanterns increase considerably in effect when the dimensions of their reflecting mirrors and of the intrinsic brilliancies of their lights are increased. Repeated experiments have been made in this direction, concave mirrors 40 to 60 centimetres in diameter being used. (Figs. 3 and 4.)

With a diameter of 60 centimetres, it may be assumed that the outside practical limit has been reached, not so much on account of the cost which rises considerably with an increase of surface, but more particularly because the dimensions of the mirror govern the proportions of the whole apparatus, and with a 60-centimetre mirror these become fairly bulky and produce difficulties with regard to transport.

Various means were resorted to in order to increase the brilliancy of the light. At first an apparatus was constructed on the principle of the reflector lanterns, with a ground mirror of 40-centimetres diameter and using a petroleum lamp of 40 candle-power. But the results of these experiments were not particularly favourable, as the increased effect was slight in proportion to the simple reflector lantern with 30-centimetre mirror and lamp of 15 candle-power, and was not in proportion to the increased cost and the bulk of the apparatus, the cause of which is explained in the following sentence.

In petroleum lamps a higher candle-power can only be obtained by employing larger wicks, thereby increasing the size of the flame. For visual signalling, however, a large flame is no more useful than is a small one of equal intrinsic brilliancy, because by enlarging the flame the rays of light reflected by the mirror are dispersed to a greater angle than by a smaller one. A large flame is certainly visible over wider limits measured at right angles to its beam, but is not clearer at any fixed point in the beam than with a small flame, and therefore is not visible at greater distances. In addition, there is the difficulty of attending to a larger burner, as compared with that of an ordinary lamp; large burners, moreover, give a reddish-yellow flame, and when not properly attended to they are liable to smoke and burn dimly.

When it was thus ascertained that the light from a petroleum lamp could only be improved to a very slight degree, the necessity was apparent of seeking other sources of more intense intrinsic brilliancy.

V. *Signals with Magnesium Light.*—Magnesium light seems to suggest itself at once as an illuminating agent, being very effective and easily managed.

The metal, as we know, when burnt in the form of thin tapes or threads gives a very intense light, and it is quite possible to produce with a single tape a light of from 130 to 180 candle-power. Certainly, the dense smoke and the rapidity with which a coating of magnesia forms on the lens and on the whole apparatus mar the effect, but good ventilation does much towards remedying this evil. To keep up an even degree of light was found to be much more difficult, and, in fact, almost impossible, as the product of combustion is not a gas as in most other sources of light, but is a solid and refractory substance, viz., oxide of magnesium. The formation of oxide is simultaneous with the burning process, prevents admission of air and has a cooling effect, for which reasons the size and intensity of the light decrease in proportion to the accumulation of oxide, until the layer of oxide drops off, when the flame by the free admission of air again assumes for a time its normal dimensions. It occasionally happens that the flame is stifled and extinguished before the oxide falls off. To prevent this irregularity, or at least to reduce it to a minimum, there are two remedies:—

The one is to remove the oxide crust by means of rollers, and thus to keep the light fairly steady. The other is to use several tapes side by side, which tend to produce an even light, the momentarily small flame of one being compensated for by the simultaneous larger flames of the others.

Lamps with two, three, and six tapes were constructed and subjected to exhaustive trials; but in spite of the most exact regulation of the mechanical motor appliances a flame of even intensity could not be obtained, on account of the fresh difficulty presented by the inequality of the tapes, which excluded an equal raising of them severally; and when in a combination of several tapes one of them is in advance and another backward, it is, naturally, impossible to produce an even and continuous flame. Thus, although the magnesium light commends itself for signalling purposes by its great power and handiness, its employment, on the other hand, is excluded by its ever varying intensity, because a fluctuating light seen at a great distance might produce the impression of an intermittent obscuration, and it would be difficult to distinguish these casual effects from the obscurations used in signalling.

A further trial with a lamp of different pattern was also without results. In this lamp the magnesium is used, not in the form of tapes or threads, but finely powdered.

The signalling is done by blowing with bellows a certain quantity of powdered magnesium for long or short periods through a benzine flame, thus igniting the magnesium and producing a large and very intense light.

In order to ensure a rapid and unfailing ignition the powder is not blown by air alone, but with a mixture of air and benzine vapour. By this means the oxide formation at the burner is prevented, but there is still the difficulty of producing an even flame for the short period of 6 to 8 seconds, and the flame is so large (about 30 to 35 centimetres high and 4 to 7 centimetres wide), that it is difficult to concentrate it through a reflector in any fixed direction. When, therefore, the light is equal to

3,000 candle-power, it is not more clearly visible at great distances than is a small but well-concentrated light. There is, in addition, the high cost of magnesium to be considered, of which a considerable quantity is consumed when used in the form of powder.

VI. *Signals with Lime Light.*—Drummond's lime light affords another source of intense light. It is, as we know, produced from a mixture of oxygen and hydrogen gas directed on a small cylinder of lime, which is raised to a white heat and produces an intense light.

The production of such a light was formerly an inconveniently elaborate process. The oxy-hydrogen gases had to be produced initially and stored in gas holders, they had then to be compressed for field use into steel or copper reservoirs. The extraordinary spread of amateur photography in recent years has created a lively demand for strong sources of light, and has induced private firms to supply highly compressed oxygen in steel chambers. Ordinary coal gas can be substituted for hydrogen, and thus the production of lime light becomes a simple matter where gas works exist.

In order, however, not to be handicapped by the absence of gasworks, lamps are constructed in which the vapours of petroleum ether are consumed in contact with the stream of oxygen, which in conjunction with a lime pencil also gives a very intense light. A further improvement is made by using zirconia or compressed magnesia pencils instead of lime pencils, which are apt to be affected by moisture.

The former are dearer, but can be used in many cases where the lime pencils are useless.

According to experiments made by the Military Committee a lime light equal to 500 candle-power was obtained by the use per hour of 80 feet of oxygen and 160 feet of ordinary gas, the intensity of the light being more than doubled by using double the quantity of gas (1,150 candle-power). With the ordinary burners in use a more intense light could only be obtained by using considerably more gas, out of proportion to the effect, and therefore not economical.

The ordinary steel cylinders of commerce are 52 centimetres in length, 10 centimetres in diameter, and have a capacity of about 4 litres. The material being from 6 to 8 millimetres thick, they admit of being filled with oxygen under a pressure of 200 atmospheres, and can therefore receive up to 800 feet of gas, with a total weight of 8 to 10 kilogrammes. The consumption being from 80 to 160 feet of oxygen per hour, a reservoir of this kind is sufficient for a light of either 500 or 1,000 candle-power for 10 or 5 hours respectively. The weight of the lamp, the petroleum ether and other appurtenances being slight, it is possible to keep up a light of the above strength for 5 or 10 hours with an apparatus not exceeding 20 kilogrammes in weight. This is a trifle in comparison to the weight of an electric plant calculated to produce a similar effect, which requires either an apparatus of 50 Bunsen elements, or a dynamo with a petroleum motor of $1\frac{1}{2}$-H.P. In the first case the weight would be about 400 kilogrammes, and in the latter 1,000 to 1,400 kilogrammes, *i.e.*, 20 to 70 times the weight of the lime light

apparatus, which is a serious item in the matter of mobility. Furthermore, the handling and care of an electric plant is much more complicated and difficult than is that of the lime light, the use of which can readily be acquired by any man of average intelligence selected from the ranks.

Appreciating these advantages of the lime light, experiments were made with it, employing the reflector lantern mentioned in Sect. III., the projector of 60 centimetres diameter and the signal apparatus of Tyschen, which will be dealt with hereafter. The results obtained were that the signals were seen by day and in sunshine with a medium telescope at a distance of 24·5 kilometres (Kahlenberg and Eichkogel near Guntramsdorf).

With the reflector lantern the signals were just sufficiently distinct, but with the 60-centimetre projector very good, so good indeed that the signals could be distinguished with a binocular glass and even with the naked eye.

The light, however, had not the effect of the electric arc light, but appeared of a reddish-yellow colour. The atmosphere was fairly clear during the experiments, but by no means free of vapours.

The main purpose being to find a light which should be visible *by day* at distances from 14 to 25 kilometres, and even farther if possible, the maximum range by night was not ascertained; but it may be assumed from the results of prior experiments, with a small electric arc light, that lime light is effective at night to a distance of 47 to 50 kilometres.

The experimental employment of lights which are visible at long distances by day had a double purpose. Flag signals which, as has already been seen, are very suitable for day signalling, are combined with the disadvantage of being visible in all directions, and, from being so noticeable, they attract not only the attention of the enemy but also his fire; and therefore it is only possible to conceal the purport of messages by the employment of cypher, whilst it is impossible to conceal the fact that communication is being made. Signalling with lights, on the contrary, is difficult and often impossible, to detect by day, hence the process gives a better guarantee of secrecy. On the other hand, the range of flags is also more limited and extends only under favourable conditions from 25 to 37 kilometres.

The experiments with lime light were repeated in the Tyrol, but less favourable results were obtainable at 14 kilometres, the light being visible by day but not as distinctly as were the flags for reading purposes. Considering therefore the greater simplicity of flags, the Drummond light may be put out of question for such distances by day, and reserved only for very long distances exceeding 40 kilometres by night.

VII. *Signals with Electric Light.*—The most powerful source of light tried for signalling purposes was the electric light, which was used in two ways:—

a. In the first method electric lamps were put into the apparatus illustrated in Figs. 3 and 4 and worked with a current of 6, 10, 20 and 40 amperes (800, 1,800, 5,000, 9,000 and 12,000

candle-power). Even with the weakest current the light was visible by day with a telescope up to 25 kilometres, and with 5,000 to 12,000 candle-power as far as 47·5 kilometres in daytime; but a trial over the points Kahlenberg-Sonnwendstein on the Semmering Mountain, a distance of 80 kilometres, was unsuccessful both by day and night, on account of the atmosphere being insufficiently clear.

In these experiments the light was directed, as usual, by the mirror as accurately as possible upon the opposite station.

b. The other method of signalling with electric light was by means of the comet-like beam of light reflected at night from a projector which is visible for relatively great distances. In these experiments the projector of the portable electric apparatus was directed towards the sky at an angle varying from 30° to 50°, and the beam of light visible in the atmosphere in all directions was observed from various stations.

During the first experiment of this kind the apparatus was placed in the yard of the electro-technical factory of Bruckner, Ross & Co., Baumgasse, Vienna, III., whilst observing stations were fixed at the Schmelz, the Kahlenberg, in Kaiser Ebersdorf, Klosterneuburg, Korneuburg, Mödling, Baden, Felixdorf, Wöllerdorf, Wiener-Neustadt, Hainburg, and Neulenbach. The light was worked with various currents, viz., 12, 25, and 50 amperes (2,000, 7,000, 18,000 candle-power) with the result that the signals were seen to a distance of 42 kilometres (Wöllerdorf, Wiener-Neustadt).

Secrecy is, of course, out of question in this method, which necessitates the use of a cypher code. On the other hand, there is the advantage that these signals travel, so to speak, round the corner, *i.e.*, they are effective between stations hidden from one another by intervening heights and mountains, as is the case between Vienna and Neulenbach, where in spite of a chain of mountains the signals were seen.

Other experiments at ranges of 40 to 100 kilometres were not successful, owing to the state of the atmosphere.

The explanation of such signals being visible over the tops of intervening high mountains is that the beam of light directed upwards, although it has to traverse the atmosphere and although it continuously loses illuminating power owing to its divergence, yet the absorption in the higher regions is small. This will be understood on referring to Fig. 5.

When the beam strikes the clouds (as shown at *W* in Fig. 5) and lights them up the signals become more prominent. This result was observed at trials in Baden and Ansbach.

It may be taken for granted that special apparatus for this method will not be adopted, but a search-light apparatus may occasionally be made as an accessory for signalling purposes.

VIII. *Signals with the Light of the Sun.*—By far the most distinct signals can be given by means of the heliograph. A heliograph of a simple and suitable construction is that made by Bayer and Bessel (Fig. 6).

It consists of an ordinary plain mirror *S S*, which can be revolved in both horizontal and vertical directions around the axes *a a* and *z*. Opposite to the mirror is a short tube *R*, firmly fastened to the bed *u u* and provided with a lid *T*.

Inside of the tube are cross-hairs. The whole can be fastened to a stand by the screws *m m*.

The method of using the apparatus is as follows :—

The mirror is placed so that the opposite station can be seen through a small spot *O*, scraped out at the back of the mirror, and the tube *R*, in alignment with the cross-hairs. This done, the lid *T* is turned down and the mirror then moved in both directions until the light is reflected into the tube *R* and in the exact direction of the opposite station. The signals are made by obscuration either with a card or a special appliance. Some apparatus are constructed to admit of a vertical change of direction of the mirror by a key, when the light goes up, and is invisible at the opposite station, the mirror falling back into the original position on releasing pressure on the key.

Experiments made by the Military Committee in 1874 and 1875 gave a range of 54 and as high as 95 kilometres ; the latter between Schneeberg and Hundsheimerberg near Deutsch-Altenberg ; in daytime, of course, as sunlight is the first condition.

The larger the mirror and the more exact the adjustment, the better the effects.

A heliograph of the Mance system combining both these advantages is shown in Fig 7. It is the same in principle as that of Bayer and Bessel's, only the mirror *S S* and the sighting arrangement *V V* are mounted on separate stands, which allows of tenfold increase of distance between mirror and sight, and therefore ensures a more exact alignment on the opposite station. The mirror is also larger. The place of sighting tube is taken by a disc *V V*, with a circular opening and cross wires. As in the former, the sight is taken through a small hole in the mirror and over the cross, the mirror being so adjusted that the reflected light falls in the opening of the disc and a concentric halo of light *r, r, r, r* appears on the margin. By pressure of a key *T* the mirror is elevated to a slight angle, and the obscuration effected.

When the sun is at the operator's back, a second mirror is required, also movable in all directions, and by a double reflection the desired direction is given to the light. It is best that the auxiliary mirror should be the larger one, as otherwise the whole area of the first is not lighted up.

Although the heliograph is very effective, its employment must be limited, as clear days and sunshine are essential, and it often happened during the experiments that clouds were hanging over one or the other station, and made communication impossible.

The heliograph is employed most successfully in cloudless Egypt, and in India, where it is much used by the English troops.

A further drawback is that the heliograph can only be used in the open, and can scarcely be placed in the interior of a casemate, which is possible with other signalling apparatus using artificial light.

IX. *Signalling Telescopes.*—In the before-mentioned signal lanterns, mirrors are required to reflect and concentrate the light, but a similar effect can be obtained by means of signalling telescopes with glass lenses. Neglecting the consideration of the varying transparency of the air, the success of optical signals depends not merely on the intensity of the light and on the size of the reflecting mirror, but also on the dispersion, which is a material factor. As we shall prove elsewhere, the theoretical condition that rays of light proceeding from the focus of a concave mirror or glass lens may be sent forth in a bunch of exactly parallel rays is practically unattainable, because this would require the concentration of the source of light into a mathematical point, whilst in reality every flame, and every light produced artificially, has a certain area, which is greater in proportion to its power. Every apparatus, therefore, sends forth the rays, not parallel, but diverging at a slight angle. In apparatus with concave mirrors this angle varies between 2° and 10°, and can only be reduced to 1½° under most favourable conditions. But in employing telescopes the bundle of rays can be concentrated to 20 or 30 minutes, and, therefore, it is clear that an apparatus with a dispersion of 2° throws its light upon a surface thirty-six times as great as an apparatus with a dispersion of only 20 minutes.

Using in both cases the same source of light, the concentrated light of the latter would be thirty-six times clearer to the distant observer than that of the former.

The construction of telescopes, as represented in Figs. 8 and 9, rests upon this idea. Any telescope with large objective will answer; it requires no alteration, but is only provided with the astronomic ocular glass, that is, with a powerful magnifier with small focal length. In front of the ocular an ordinary petroleum lamp *L*, or any other source of light, as intense as possible, is placed.

The rays taken up by the ocular *O* (Fig. 10) unite in the point *P*, which, however, is not the focal point, the light not being at a distance, but, on the contrary, very close to the ocular lens. But the point *P* must be the focal point of the objective lens to satisfy the condition that the rays proceed from the objective lens in a direction as nearly parallel as possible. It is naturally impossible to obtain exact parallelism, for however small the concentration of the light at the point *P* may be, it is far from being a mathematical point, but the dispersion decreases in proportion to the decrease in focal length of the ocular.

A concentration of the rays down to 20 minutes is obtained with telescopes, but the advantage in respect of theoretical intensity is considerably reduced because oculars of small focal lengths have also a small diameter, and therefore receive only a comparatively small fraction of the rays from the lamp, the remainder being lost for signalling purposes. As a rule a second terrestrial telescope *B B*, placed upon the same stand with the signalling telescope *S S* (Fig. 9) is used in the adjustment of the signalling instrument, and for observing the opposite station. The better the source of light, and the larger the objective, the greater the effect of the instrument.

A suitable proportion between the focal length and the diameter of the object and ocular lenses is essential. In practical experiments with telescopes the results were not particularly satisfactory on the whole. An instrument with non-achromatic object lens of 20 centimetres diameter (90 centimetres focal length) carried signals to a distance of 25 kilometres by night, visible to the naked eye, but at the very limit of discernment; and the signals from a smaller telescope of 5 centimetres diameter (80 centimetres focal length) could be read at night with a binocular glass at the same distance, the angle of dispersion being 20 minutes in the former and 30 minutes in the latter. An ordinary petroleum lamp of 10 candle-power was used. In daytime, however, the signals in both instances were not visible at 9·5 kilometres, not even with a good telescope.

A trial was then made to increase the distinctiveness of the signals by using an electric lamp, a so-called semi-incandescent lamp on Reynier's system. Such a lamp (Fig. 11) consists of a thin carbon pencil *K K* of about the thickness of a knitting needle, resting upon a small wheel *V* of retort carbon. The pencil is enclosed in a metal case *h h*, and a small weight *g* presses it downwards.

When an electric current is led from "*a*" into the metal case by *h* and the contact brush *S* into the carbon *K* and back by *r b*, portions of *K* and *r* become white-hot, and a specially intense light is generated at the point of contact *c* between the wheel and the carbon pencil; and as this light has a limited area, it appeared most favourable for use with signalling telescopes. The experiment was made in daytime, 12 large Bunsen elements being used in feeding the lamp, which produced a light of 50 to 60 candle-power. The results on account of the unfavourable condition of the weather being unsatisfactory, the experiment was not repeated, the care of so many Bunsen elements being too complicated for practical use. Using petroleum light the telescopes gave less distinct signals than the simpler and cheaper reflector lanterns, and therefore experiments with telescopes were abandoned, their adjustment being difficult and requiring much practice and technical knowledge, and on that account they were found less suitable for employment in fortresses.

X. *Mangin and Tychsen Apparatus.*— Mangin's apparatus is very practical, as also is another form of the same, improved in some details, by Tychsen. This apparatus (Figs. 12 and 13) consists of a square prismatic steel case *a b c d*, on the front face of which a large bi-convex glass lens *L L* is let in. In the focus of the lens there is either a petroleum lamp *R*, in Fig. 12, or sunlight is used, as in Fig. 13, for which purpose a plain mirror *S S* is used which reflects the light upon a lenticular system *e e*, $e_1 e_1$, producing a concentration of light at the focal point *R*. If necessary, an auxiliary mirror $S_1 S_1$ can be added.

The lamp or sunlight concentrated at *R* is, with a small angle of dispersion, thrown on the opposite station through the lens *L L*. A telescope is used for the adjustment of the apparatus and for observing the signals from the opposite station; this is enclosed in the case *a b c d* (not seen in Figs. 12 and 13), and its optical axis is parallel to the axis of the lens *L L*. The case has a partition, *W W*, with an

opening *O O*, which can be closed at will with a shutter *K*, by pressing a knob. By this arrangement the signals are worked. The apparatus rests upon a three-legged stand, and can be moved in a horizontal as well as a vertical direction.

The flap *d* in front serves as protection against sun and rain.

The Tychsen model is constructed to use besides petroleum and sunlight also electric and lime light. It is also produced in various sizes with object lenses of 10 centimetres diameter in the so-called Cavalry apparatus, and of 14 centimetres diameter for field and fortress use.

Practical trials with the smaller Mangin model using petroleum light gave a range by day, using a telescope, of 4 kilometres and 25 kilometres at night; by using sunlight the range was 12 kilometres for the naked eye, and 25 kilometres, but indistinct, with a telescope.

The results of trials with the larger Tychsen model were as follows:—

a. With lamplight.

By day with the telescope, indistinct at 12 kilometres, and with the naked eye invisible at 4 kilometres; at night with the naked eye barely visible at 25 kilometres, but distinct with telescope.

b. With limelight (500 candle-power).

By day indistinct with the naked eye at 12 kilometres, but visible at 24·3 kilometres with telescope.

c. With sunlight.

At 25 kilometres good with the telescope, but indistinct with the naked eye.

It is thus seen that both models when using lamp or lime light are inferior to the simple reflector lantern, but have the advantage of being able to work with sunlight and to obtain a range of 25 kilometres by day.

XI. *Balloon Signalling.* — Captive balloons — capacity, 100 to 150 cubic metres—are used and lighted and obscured by electricity conveyed along the cable holding them.

An experiment was made in Belgium with a balloon of 4·5 metres diameter. It was allowed to ascend 90 metres. It was seen well at night at 4 kilometres, but absolutely invisible at 18 kilometres.

Another method is to direct a search light upon a captive balloon.

The system is impracticable on account of difficult arrangements, can only be used in calm weather, and the results are not satisfactory.

XII. *Concluding Remarks.*—The above detailed apparatus may be taken as the most important types for land service, and it has been shown that a variety of implements exist for signalling, both by day and by night, to a distance of 25 kilometres. But for greater distances—say 40 to 80 kilometres—possibly often required for military purposes, we have only the heliograph and large concave glass mirrors with electric light, both of which can only be used under certain conditions; the former only with a clear sky, the latter if electric apparatus be at hand and suitable transport be obtainable.

Both of these conditions can only exceptionally be met.

It appears desirable, therefore, to make further improvements in signalling apparatus for long distances, which task will be the object of

Fig. 1.

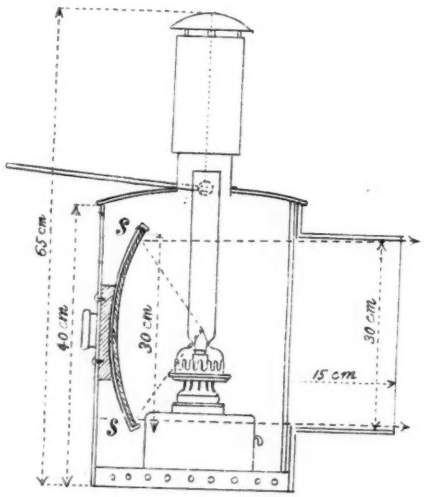


Fig. 2.

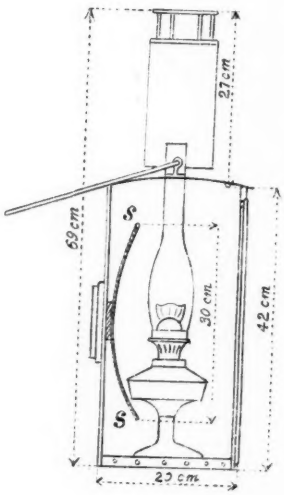


Fig.

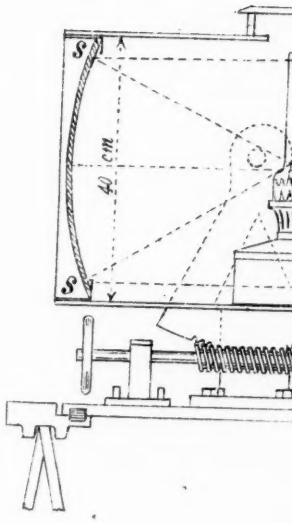


Fig. 6.

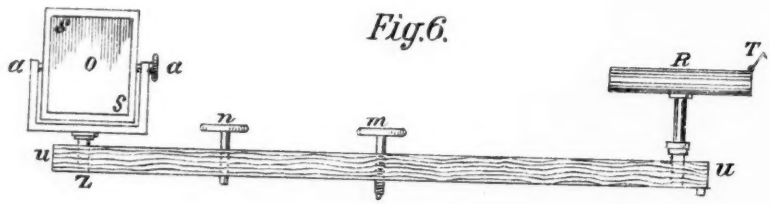


Fig. 8.

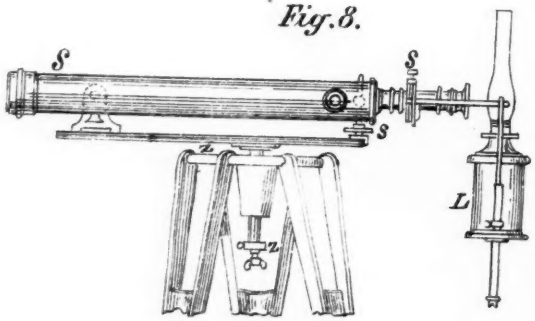
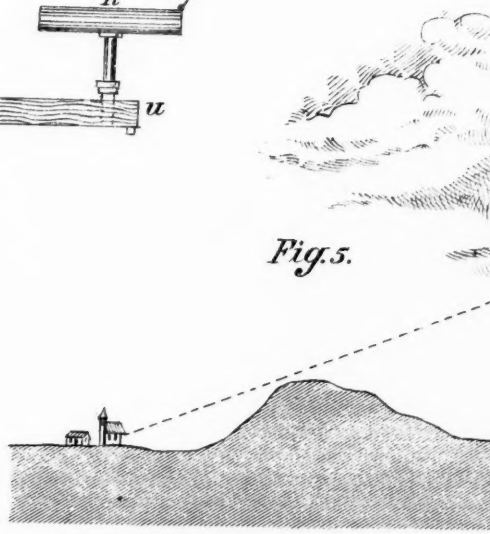


Fig. 5.



S.M.E. Chatham.

J. J. Kelliher & Co Litho. London.

Fig. 3.

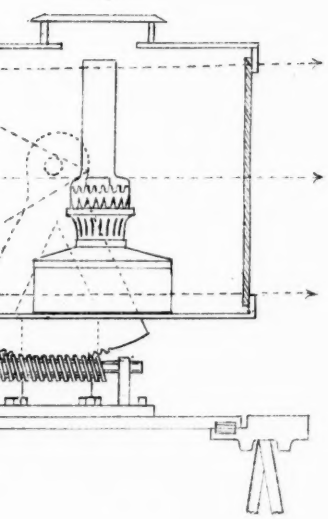
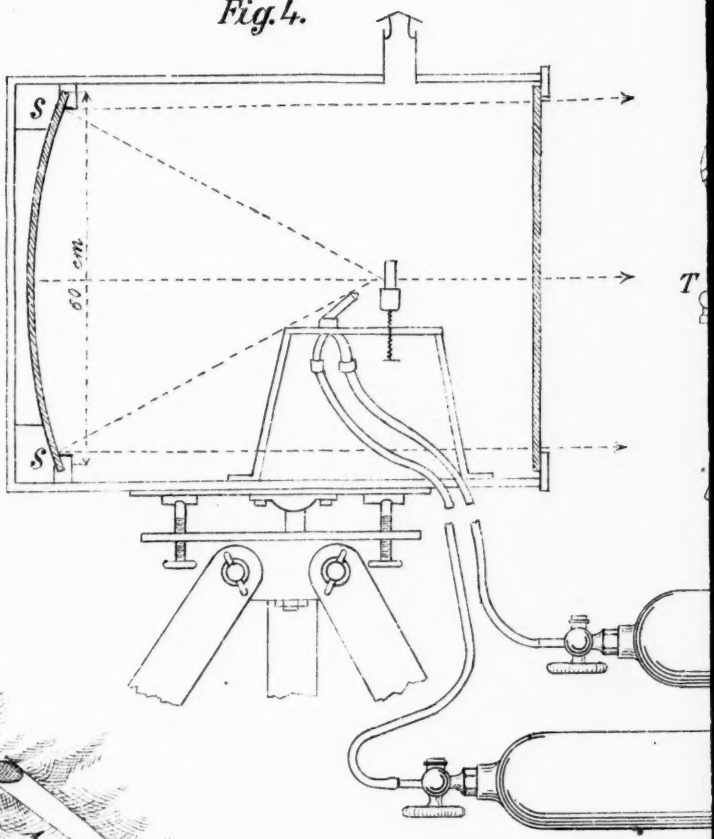
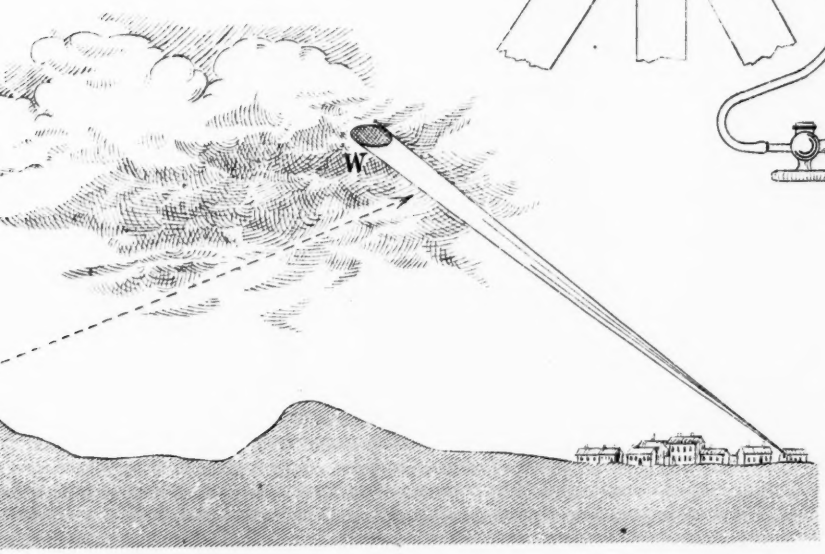


Fig. 4.





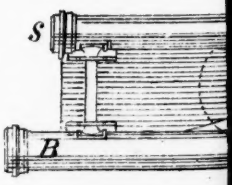


Fig. 7.

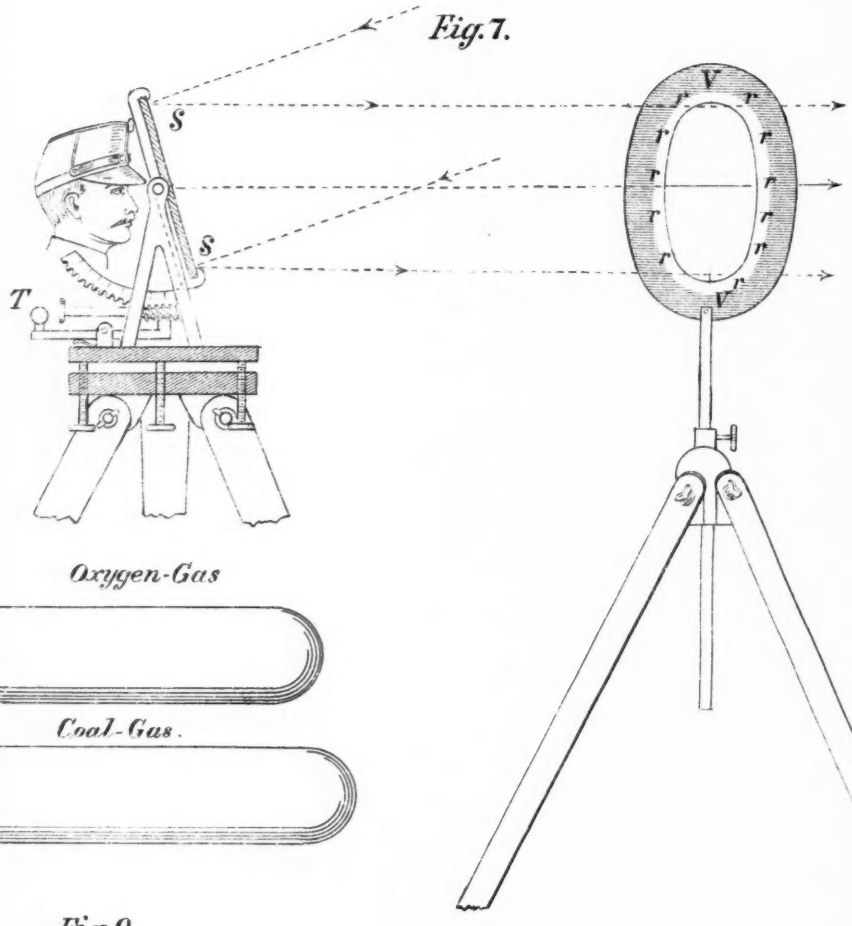


Fig. 11

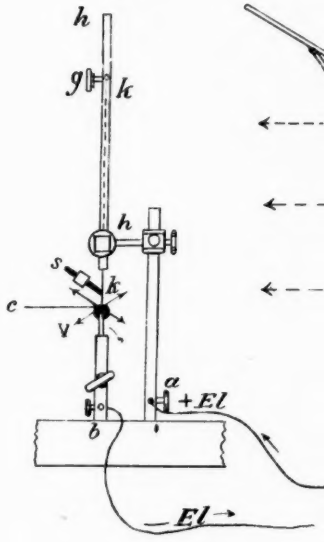


Fig. 9.

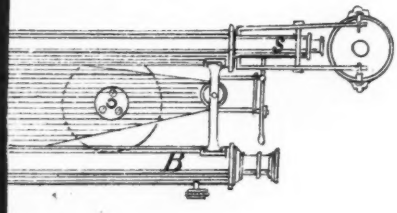


Fig. 10.

Fig. 12.

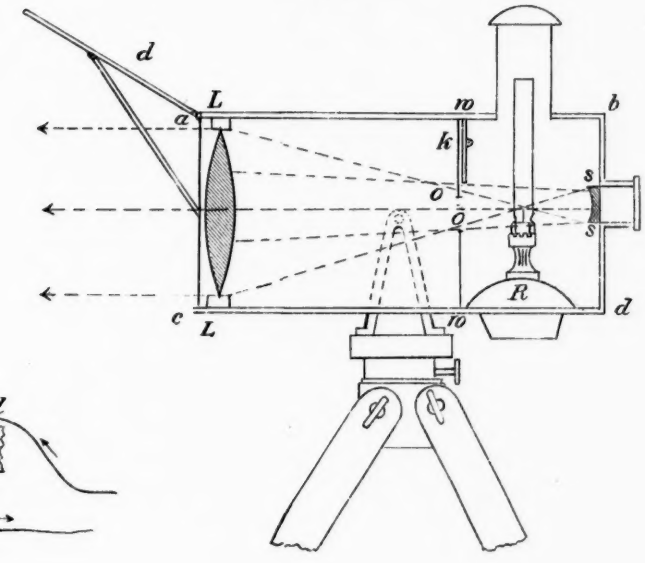
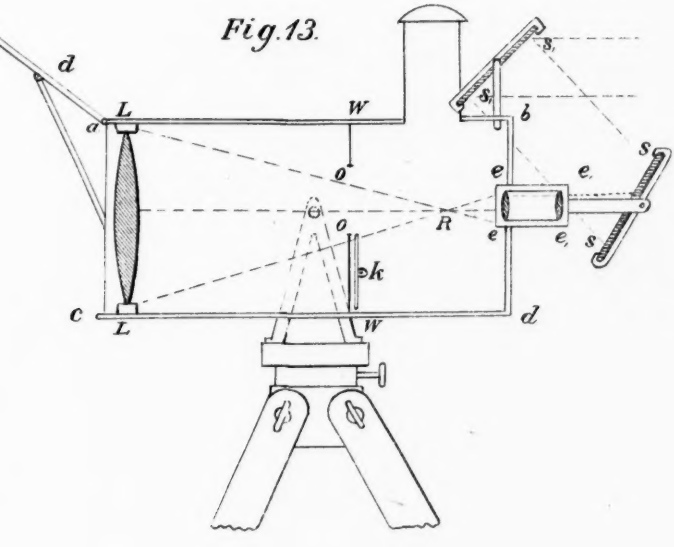


Fig. 13.



further experiments by the Military Committee. In conclusion, there is another circumstance to be considered, *i.e.*, the atmospheric condition, which is of first importance in all kinds and methods of visual telegraphy.

When it is said that an apparatus has such and such a range, the expression only holds good for a certain degree of transparency of the air and the kind of light used, both of which vary under circumstances without it being possible to give in figures the exact transparency of the air or the influence of sunlight.

Irrespective of dense fog (such as, for instance, the well-known and notorious London fogs) which can attain such a density as to make it impossible to see objects at 2 metres, there are various degrees of transparency even when the atmosphere is apparently clear. At short distances, in streets and open places of a town, these differences are not noticeable, but they are at long distances, when they play a most important *rôle*.

The limits of transparency of what is considered a clear atmosphere may be defined by considering that the outline and contours of mountains may be seen as distinctly at 80 to 90 kilometres on perfectly clear days as at 3 to 4 kilometres on hazy days, a variation of 20 to 30 degrees.

A layer of fog 10 metres in thickness absorbs as many rays as an 8,000 times thicker layer of clear air.

[Here follow notes on the unsuccessful attempts to measure the transparency of the air.]

Background.—Not less important for the distinctness of day signals is the effect of contrast between the colour of the signalling instrument and the background. The darker the background, the clearer and more visible at longer distances are the signals. For this reason light signals are more distinct under a cloudy sky than in bright sunshine, and are naturally best at twilight or in complete darkness, when the contrast is greatest.

The dependence of the distinctness of signals on variations in the condition of the atmosphere, on the varying contrast effect, and on the greater or lesser degree of expertness in the use of the telescope, explain the many often contradictory opinions on apparatus, whereby good and effective instruments are frequently discredited.

It cannot be denied however that signalling, in spite of defects and disadvantages, offers a good and often indispensable auxiliary for many military purposes; and its study should, therefore, not be neglected.

See Table showing results of experiments.

TABLE OF RESULTS OF TRIALS OF VARIOUS SIGNALLING ARRANGEMENTS.

Types of Signalling Apparatus.		Source of Light.		Ranges in Kilometres at which Signals were seen.				Remarks.
				By Day.		By Night.		
Description.	Diam.	Description.	Candle-Power.	With the naked Eye.	Through a Telescope.	With the naked Eye.	Through a Telescope.	
Small Signal Telescope ..	5 c.m.	Paraffin Lamp	10	0	4	?	25 (weak)	
Small Signal Telescope ..	5 ,,	Semi-Incandescent Electric Lamp	50	?	?	?	?	Bad weather.
Large Signal Telescope ..	20 ,,	Paraffin Lamp	10	0	4	25 (very weak)	25 (good)	
Mangin Lantern	10 ,,	Paraffin Lamp	10	0	4	12 (weak)	25 (weak)	
Mangin Lantern	10 ,,	Sunlight	?	12	25 (weak)	—	—	
Tychsen Lantern	14 ,,	Paraffin Lamp	12	0	12 (weak)	25 (very weak)	25 (good)	
Tychsen Lantern	14 ,,	Sunlight	?	25 (weak)	25 (good)	—	—	
Tychsen Lantern	14 ,,	Limelight	500	12 (weak)	25 (weak)	?	?	Not tried by night.
Ebner Lantern	30 ,,	Paraffin Lamp	6	0	12 (weak)	25 (good)	25 (very good)	
Reflector Lantern	30 ,,	Paraffin Lamp	12	0	12	25 (good)	47 (very weak)	
Reflector Lantern	30 ,,	Semi-Incandescent Electric Lamp	50	?	25	?	?	
Reflector Lantern	30 ,,	Limelight	500	12 (weak)	25 (good)	?	?	Not tried by night.
? ?	? ,,	Magnesium Tape	600	12 (weak)	25	?	?	
? ?	? ,,	Magnesium Powder	3000	12 (very good)	25 (good)	?	?	
Projector	60 ,,	Paraffin Lamp	40	?	25 (weak)	25 (good)	47 (very weak)	
Projector	60 ,,	Limelight	500	25 (good)	25 (very good)	?	?	
Projector	60 ,,	Electric Arc Light	800 to 9000	25 (good)	47	47 (good)	80 (?)	
Heliograph of Bayer & Bessel	? ,,	Sunlight	?	54	95 (weak)	—	—	

THE SEAMEN OF THE GUARD, 1803—1815.

By Lieutenant de Vaisseau ÉMILE BERTRAND.

Translated by permission from the "Revue Maritime et Coloniale,"

(Concluded.)

IV.—The War with Spain.

(Madrid—The Bridge of Alcoléa—Cordova—Baylen—1807-1808.)

Portugal refusing to submit to the conditions of the Treaty of Tilsit, which excluded English commerce from Continental ports, a *corps d'armée* was sent under command of Junot to take possession of Lisbon.

At the same time, Napoleon hoping to drive the Bourbons out of Spain, despatched one by one towards the Pyrenean frontier those divisions which were intended to augment Junot's corps, the object in view being to march on Madrid.

Napoleon thinking it might be necessary to assume command of this army, sent in February, 1808, by way of Bayonne, detachments of his Guard, Mamelukes, Poles, seamen, infantry, and cavalry, numbering altogether about 3,000 men, under the command of Lepic, with orders to arrive at Burgos not later than the beginning of March. Murat received the command in chief of the army, and entered Madrid on the 23rd of March. It is well known what followed. The king came to Bayonne and abdicated, and the crown of Spain was given to Joseph Napoleon, King of Naples. Napoleon now formed the idea of organising a flotilla at Cadiz from some of our old ships which had taken refuge there after Trafalgar.

The Battalion of Seamen of the Guard, between 600 and 700 strong, was ordered to proceed from Madrid to Cadiz under General Dupont, who had been sent with a *corps d'armée* to complete the conquest of Andalusia. In addition to these 600 or 700 picked seamen, Admiral Rosely who commanded a division of six ships at Cadiz, was directed to detach from these vessels 300 or 400 men, whose places were to be filled by soldiers; and so by this means the new ships would be fully manned.

General Dupont began his march towards Andalusia with his 1st Division (General Barbou), and was joined *en route* by General Pryvé's dragoons, the Seamen of the Guard, and the two Swiss regiments of Preux and Reding, amounting in all to about 12,000 men. He crossed the province of La Mancha without difficulty, threaded the redoubtable defiles of the Sierra Morena, and arrived on the 3rd of June at Baylen, where he heard for the first time of the general rising in Central Spain, and that the Spanish troops had made

common cause with the insurgents. From Baylen he followed the course of the Guadalquivir, as far as Andujar, where he learnt that 15,000 insurgents, headed by Augustin de Echevarri, were entrenched at the Bridge of Alcoléa, thus barring his road to Cordova. He resolved to march at once on the enemy, and at 7 a.m. arrived before the bridge, which was defended by an épaulement and a deep ditch. Covered by the fire from the guns Pannetier's brigade advanced to the assault of this redoubt, carrying the work by the embrasures, whilst the Seamen of the Guard, led by Captain Baste, stormed the flanks. Ascertaining that the bridge was not mined, our troops carried it at the point of the bayonet, driving the insurgents before them, and Alcoléa fell into our hands; after which the march was resumed to Cordova, which was only 3 leagues away.

The town, summoned to surrender, refused to receive the bearers of a flag of truce, so it was necessary to take it by assault. The gates were driven in by the fire from our guns, and our troops threw themselves into the streets, where each house at once became the scene of hard fighting. Destitute of everything, our soldiers, finding the insurgents rich in booty, began to pillage in their turn, and the entire town was sacked. It was then that the Seamen of the Guard showed themselves a true *troupe d'élite;* they alone rallied at the voice of command, being unwilling to sully their glorious reputation by joining in the pillage. The Spaniards, however, took a cruel revenge for the sack of Cordova, by assassinating all the soldiers who straggled, and the wounded who had fallen out on the roads. Whilst General Dupont remained at Cordova, waiting for his other two divisions and replenishing his stores, our ships at Cadiz fell into the hands of the insurgents. Bombarded by the shore batteries, without any previous warning, these ships, the *débris* of Trafalgar, were obliged to strike their colours. To send the Seamen of the Guard into Andalusia was now useless; they were, however, soon to prove that as they could not be employed as seamen, they could make the best of soldiers.

Meantime, from day to day, the insurrection became more formidable. The non-arrival of reinforcements, and the fear lest the defiles of the Sierra Morena might be closed to him, decided General Dupont to retreat on Andujar, where he arrived on the 18th of June. He there stationed the Seamen of the Guard, considering them the most trustworthy of the troops he had with him, and the remainder he sent into the surrounding districts.

After many urgent solicitations from General Dupont, General Savary, who commanded at Madrid, at last decided to send him reinforcements, and ordered the 2nd Division, under General Vedel, to thread the Sierra Morena and effect a junction with him. Another division was soon after sent to him, that of General Gobert, which was to replace the 3rd Division, then engaged in assisting General Moncy at San Clemente. The insurgents never ceased harassing our troops in the neighbourhood of Andujar. As the people at Jaen made themselves particularly notorious by the ferocity they displayed towards our sick and wounded, General Dupont determined to punish them, and despatched Captain Baste for that purpose against the town, with a battalion of infantry, a squadron of

cavalry, and two guns. He took possession of it and put the inhabitants to flight. General Vedel's division had by this time arrived, and taken up its quarters at Baylen, where it was soon joined by General Gobert's division, which was stationed a little further off in the defiles of the Sierra Morena at La Caroline. Instead of uniting his divisions and occupying Baylen, which was the real key of this defile of the Sierra Morena, General Dupont left them separated, and when he decided to quit Andujar and fall back on Baylen he was too late; the other two divisions were no longer there. On the morning of the 19th, our troops arrived on the banks of the Rumblar, where the Spanish advance posts opened fire upon them.

The retreat from Andujar and Baylen had been accomplished with much difficulty. In order not to leave the sick and wounded behind, who would have been massacred, a long embarrassing convoy of wagons was necessary, and, in order to protect this convoy, General Dupont formed a rear guard of his best troops, viz., the cavalry, artillery, and a battalion of the Seamen of the Guard; on arriving at Baylen, instead of finding a French division, he tumbled on the enemy, strongly encamped, and possessing an artillery much superior to our own. The battle immediately commenced, but our small 4 and 8 pounders were soon dismounted by a Spanish battery of 12-pounders, which covered the centre of their line. Three times our troops charged with the bayonet an enemy infinitely superior in numbers, but were unable to make any impression upon them. The ground was strewed with corpses. General Dupont, himself wounded by two bullets, made another attempt to force his way through. He re-formed his troops in line, encouraging them to follow the example of the Seamen of the Guard, who behaved with truly remarkable valour. But still the other divisions did not come to our assistance. Suddenly artillery opened on our rear; it was a new Spanish army that had arrived, and we were caught between two fires. From that moment all was lost. General Dupont decided to treat, and the negotiations were already commenced, when the other two divisions appeared—alas! too late. The Spanish envoys wished to consider them also as prisoners, and make them share the fate of General Dupont's troops. It was then that Captain Baste repaired to his general, and advised him to break off the negotiations, abandon baggage and artillery, force a way through, and effect a junction with the other two divisions. General Dupont, who was quite crushed, sent Captain Baste back to the envoys, who, fatigued by the long dispute, had no wish to re-open the discussion. Captain Baste returned in indignation to General Dupont, and reported what had passed, whereupon the latter gave General Vedel directions to retreat with his two divisions, and fall back in all haste on Madrid. These troops were already *en route*, when the Spaniards perceived them. They insisted on General Dupont ordering the return of General Vedel's troops, threatening the most horrible treatment to the division already in their hands, should he refuse to comply with their demand. The fatal capitulation was signed on the 22nd of July, our troops had to lay down their arms, and were despatched to San Lucar and Rota, where they were embarked on

board Spanish ships and conveyed to France, after having suffered on the road the greatest indignities at the hands of the population.

The Seamen of the Guard were soon to re-appear in Spain. After the conference at Erfurth, Napoleon, desirous of repairing the faults of his lieutenants, went to Bayonne in November, 1808, and entered Spain. He defeated the Spaniards, and arrived at Burgos on the 11th of November. On the 28th he was at Aranda, whence he wrote to Admiral Décrès, the Minister of Marine, directing him to despatch to Bayonne all the officers, non-commissioned officers, and soldiers of the Seamen of the Guard, who had returned from Andalusia, in order to re-form the battalion. This was rapidly done, and they proceeded to rejoin the Guard at Madrid, where it had followed the Emperor. Napoleon crossed the Guadarrama with his Guard, in order to oppose an English army which had come to the aid of the Spaniards. But bad news from Germany reaching him here, he handed over this duty to General Soult, and established himself and his Guard at Valladolid. At the beginning of the month of June, 1809, he left for Bayonne, returning from there to Paris, and taking his Guard with him; which he was ere long, however, to transport to the other extremity of Europe.

V.—The Campaign in Austria.

(Eckmühl—Ratisbon—L'Île Lobau—Vienna—Essling and Aspern—Wagram—Navigation on the Danube.)

It was the extraordinary preparations for war on the part of Austria which had called Napoleon suddenly back from Spain. He made ready to enter immediately on the campaign, and at the first movement of the Austrians crossed the Rhine and moved in the direction of the Danube. Mindful of the services which the Seamen of the Guard had rendered him in former campaigns, he wished to have with him besides his Seamen one of the battalions of the flotilla at Boulogne, and with this object wrote as follows to the Minister of Marine, March 9th, 1809:—"Monsieur le Vice-Amiral Décrès,—I desire to have one of the battalions of the flotilla for the Army of the Rhine. These are my wishes: inform me whether they can be fulfilled. Twelve hundred seamen would be very useful this year for crossing rivers and in the navigation of the Danube. My Seamen of the Guard have been of great service to me in former campaigns, but they were employed on services unworthy of them. Can all the sailors who form the battalion of the flotilla swim? Do they understand the management of boats, both on the open sea and in river work? Have they been taught infantry drill? If they have all this knowledge, they will be very useful to me."

Hearing from the Minister of Marine that the battalions of the flotilla were equally capable of serving on land as well as by sea, Napoleon ordered to the Army of the Rhine the 44th Battalion—1,200 strong—which was placed under the command of Captain Baste. The Battalion of the Seamen of the Guard was reduced to one company of 140 men, Napoleon finding that number quite sufficient for his Guard. The remainder were dispersed amongst the battalion of the flotilla and

sent on to the frontier. The men, who were well armed and equipped, carried, besides their usual arms, tools *en bandoulière;* those of the first company carried axes, the second mattocks, the third pick-axes, and the fourth shovels. This battalion was attached to the engineer corps and placed under the supreme command of General Bertrand, who was in command of the engineers of the Army of the Rhine. A naval officer was sent forward to insure success in the navigation of the Danube and to investigate the nature of the river between Ulm and Passau. He purchased a large number of boats and collected them at Ratisbon and Passau; these were to form one or two bridges, and to allow of the troops manœuvring on either bank. On their arrival at Augsburg, the seamen were sent to Passau, where Captain Baste was ordered to construct six vessels, which were thought sufficient to enable us to be masters of the Danube. Two hundred and forty seamen remained at Passau to hurry on the works, the others continued their forward march, capturing any boats which they came across in the tributaries of the Danube.

The victory of Eckmühl and the taking of Ratisbon had opened up to us the road to Vienna. On the 10th of May our van was under the walls of the town, just a month after the outbreak of hostilities. The place was invested, and capitulated on the 13th. Our object now was to cross the Danube and to give battle to the enemy's army which had gathered on the opposite bank. Numerous reconnaissances were made, in order to select the most favourable points for crossing: and Seamen of the Guard were chosen in preference for this service. They threaded their way through the islands until within five leagues of Ebersdorf, always keeping on the right bank of the river, crossing all the streams that came in their way, and taking note of what boats they saw, that they might send vessels to seize them. The principal object of these expeditions was not solely to take boats, but also to take notice of the enemy's position and to see that they were not in force there.

Napoleon chose the nearest point to Vienna as his crossing place, where the Danube diverges into multitudinous streams, and is thickly studded with islands, of which the largest, that of Lobau, has since acquired a certain celebrity. To reach the Island of Lobau it was necessary to cross two arms of the Danube; and once on the island, bridges were constructed to cross the third arm, which brought them in juxtaposition to the enemy. The passage began on the morning of the 18th May, and the construction of the bridge was immediately commenced, which would enable the army to cross the third and last arm. The enemy's skirmishers who lined the opposite bank were dislodged by the first troops who crossed the bridge; and the whole of our vanguard had crossed by the afternoon of the 20th May and taken up its quarters in the villages of Aspern and Essling—names never to be forgotten! Our troops had scarcely arrived before the Austrian Army—90,000 strong—advanced to the attack. For six hours a desperate battle was waged in these two villages, now victory favoured the one and now the other; and when night fell, and the Austrians ceased firing, the ground was thickly strewn with the dead. The rival armies rested during

the night, during which time fresh troops, crossing the bridges of the Danube, came to reinforce our vanguard. The next day the battle re-commenced. It was our intention to assume the offensive, but when the bridges broke for the fourth time on the rising of the river Napoleon, fearing lest he might run short of provisions, decided not to advance. The Austrians returned to the charge, and the villages of Aspern and Essling were once more the scene of desperate fighting. Marshal Lannes had both his knees shattered by a bullet. All day long the battle raged, and terminated in the evening with a terrific cannonade. Napoleon decided to retire to the Island of Lobau, where the whole army was concentrated: the cables which connected the bridges with the left bank were cut, and so the river was once more put between ourselves and the Austrians. Masséna was given command of the troops on the Island of Lobau, and Napoleon, crossing the arm which separates it from Vienna, busied himself about repairing the big bridge and collecting provisions and ammunition on the Island, in view of the coming passage of the river.

Napoleon was not altogether pleased with the battalion of the flotilla which was with him. The Seamen of the Guard alone who had served with him on other campaigns were of any real value. In a letter which he wrote to the Minister of Marine on June 19th, he makes the following complaints:—"Monsieur Décrès,—As the battalion of the flotilla here must be kept up to its full strength, send me 100 men taken from different parts—but they must be sailors who know their work; for I do not wish to conceal from you that this battalion has not added to the prestige of the navy. However, the officers are good, and the battalion has been of service, but out of every thousand of these men not one-half are the equals of our pontoniers. It is most essential, then, that you send good sailors. Take steps to muster my company of Seamen of the Guard, and if there are more of my old Seamen of the Guard than are required for the formation of the company, send them as well, and arrange with the Minister of War for them to join me with all haste. I would rather have 100 men like them than all your naval battalions."

The Seamen of the Guard started immediately, and soon arrived, and at once went to work to re-establish the lines of communications.

At the same time, Marshal Davout was informed the enemy might attempt to cross from the Presburg side; and to assist in the defence at this place he was given a company of fifty-six sailors.

Napoleon, who had concentrated all his troops on Vienna, reconstructed the bridges which assured the communication between the Island of Lobau and the capital; and having given time to his army to rest after its late encounters, decided once more to take the offensive. Another point for crossing was chosen on the little arm of the river opposite Enzerdorf.

An order from the Imperial camp at Schönbrun, dated 10th June, gave the following instructions for the fitting out of the boats which were to protect the army whilst it crossed:—

1. Six vessels will be fitted out; each vessel will be supplied with two or three big guns, and from twelve to thirty oars. The two lightest of these will carry 3-pounders, two of them 6-pounders, one a howitzer, and one a 12-pounder.
2. A small floating battery will be constructed with a parapet or bulwarks, to protect the crew from grape-shot and the fire from small guns. This battery will be armed with three 18-pounders, and be supplied with anchors and all that is necessary for bringing its broadside to bear at all points.
3. The general commanding the engineers will take charge of the fitting-out of these vessels, and the general commanding the artillery will supply the necessary guns. The captain in charge of the naval detachment will give names to these boats, and tell off a commanding officer and crew to each. These boats will always carry provisions for six days.

The crossing was fixed for the night of the 4th of July, and at 9 o'clock Couroux's brigade (Oudinot's corps) embarked in large, specially-constructed ferry-boats, and escorted by the armed vessels manned by the Seamen of the Guard, under the command of Captain Baste, proceeded towards the enemy's bank. In a quarter of an hour they had disembarked and captured the redoubt of Maison-Blanche, and by means of making fast a boat-rope to a tree the free passage of the ferry-boats continued. Meanwhile, the Seamen of the Guard took possession of the Island Rohr-Tsirth, and some of the armed vessels entering the canal, which separates Hanslgrund from the Danube, took up their position opposite Zanet to attack the right bank of the river. Others were stationed between Stadlau and the left bank, as much to harass the enemy as to stop an attack against the Prater, and destroy any fire-ships which might be sent to burn the bridge.

No time was lost on the arrival of the first batch of troops on the left bank in constructing a bridge of boats. A bridge made in one single piece, which had been constructed in the Island of Lobau, was also thrown across and secured, and under an incessant fire, two other bridges were also fixed by the pontoniers and Seamen of the Guard who were not employed in the boats, and thus the army was enabled to rapidly cross the river. Captain Baste, with the armed sloops, cruised about both above and below the Island of Lobau, returning the enemy's fire at all points. A storm, which broke at this moment, joined the thunder of the artillery of Heaven to the roar of the cannon. When day broke, 70,000 men were already on the left bank, while the remainder of the army continued to cross. 'Tis not in our province to follow Napoleon in his march against the enemy, and it has fallen to the lot of other historians to describe the details of the never-to-be-forgotten battle of Wagram, which brought the war to a close. In that battle the seamen bore no part. When they had finished their work of preparing for and covering the transportation of the troops, they were detailed to construct other bridges, and facilitate—should that be necessary—a retreat to the

Island of Lobau; and, with pontoniers and sappers, to make outworks at the entrances to the bridges and other fortifications.

But these, happily, were not needed, for the victory of Wagram made us absolutely masters of the country. The Austrians sued for peace, and Napoleon returned to Vienna and turned his attention to organising a fleet of boats on the Danube to procure rations for his army.

Armed boats were stationed at Ebersdorf, and the bridge in one piece was demolished; the ferry-boats and all the vessels on the little arm of the Danube were sent back and moored to the head of the bridge at Spitz; the remainder were burned, so that all means of crossing from the arm of Lobau were rendered impossible. Three naval officers were sent to Ulm, Ratisbon, and Linz, to carry on the navigation of the Danube in such a manner that all the supplies of the army could reach it without delay. The 8th Company of the Seamen were left at Vienna and at Ebersdorf, and the remainder were sent to Passau to secure the navigation of the river from that place to Vienna. These seamen were to rig-out a large number of boats, and to procure food, artillery, and clothing for the army. Captain Baste took up his quarters at Vienna, and put himself into communication with the Commissariat-General and General Lariboisière, commanding the artillery both for the army and for Vienna. A harbour was made at Passau, and the naval engineers constructed, for the transportation of the troops, vessels of a uniform type, drawing as little water as possible, in order that they might be able to navigate the shallowest parts of the river. Captain Baste first sent three sailors on each boat down as far as Raab to gain knowledge about the navigation of the Danube, and as soon as they reached their destination they were sent back by road to Vienna, and re-commenced the same voyage, so that they might be able to make the journey to Raab by water without the help of local pilots. Two companies of pilots were in this way organised to carry on the boat-service—one between Passau and Vienna, and the other from Vienna to Raab. Naval officers were stationed as harbour-masters at Passau, Linz, Molck, Vienna, and Raab. Each of these had an armed sloop and a battalion of infantry in charge of the river-service under his orders. They had to board all passing vessels, and these, moreover, were obliged to stop at certain fixed points, where detachments of Seamen of the Guard were stationed. On the 1st and 2nd of September a grand parade was held at Schönbrun. The engineers marched past the Emperor with the artificers and Seamen of the Guard who were attached to that corps. These last were once more warmly congratulated by Napoleon, who, besides, had not forgotten them in the order of the day after the crossing of the Danube. Little by little the state of the country became more peaceful, and the troops began the evacuation. On the 9th of December, the seamen received their marching orders, and returned to France by way of Strasburg.

VI.—Expedition to Portugal.

(Torrès-Vedras—Pombal—Redinha—Fuentès d'Onore—1810.)

In response to the entreaties of King Joseph, Napoleon began another expedition to Andalusia, but he calculated on the co-operation

of the troops of which it was composed in assisting the *corps d'armée* which was already marching on Lisbon with the object of driving the English out of the Peninsula. This force was commanded by Marshal Masséna. Taking into consideration the immense services which the seamen had rendered him in Germany, and thinking that the length of coast-line in Spain would give them still greater opportunities, Napoleon decided to take them there; and in the month of January, 1810, the Seamen of the Guard received orders to start for Burgos, where the Imperial Guard was to assemble, and hold themselves in readiness for the Emperor's orders. At the same time the 43rd Battalion of the flotilla was ordered to St. Sebastien, Madrid, and from there to Cadiz. Another battalion was attached to the Seamen of the Guard at Burgos, who were still commanded by Captain Baste. They were to be attached to the engineers under General Dorsenne. In the meantime, Marshal Masséna had driven back the English as far as Lisbon, and halted before the formidable lines of Torrès-Vedras. He could not attack them without the assistance of other troops, but, in spite of his appeals for help, he had but very insignificant reinforcements sent him, whereas a whole division would not have been too much. The Seamen of the Guard were sent, but too late to render any assistance in crossing the Tagus, and, indeed, they only arrived at the moment when the Marshal had decided to retreat. This battalion of picked troops was given the post of honour and formed the rear-guard when, on March 4th, 1811, the army began its retreat. Wellington was not slow to perceive our movement, and followed our army, harassing it as it marched. But he had to deal with Marshal Ney, who commanded the rear-guard, and who, in the battles of Pombal and Redinha, made him pay dearly for our evacuation of the banks of the Tagus. As in the disastrous expedition to Spain, in 1808, the seamen, who were not to be employed as combatants except in cases of extreme need, behaved under fire with their accustomed gallantry. The army retired to Old-Castille, and, after the battle of Fuentès d'Onore, which did not encourage us to assume the offensive, the seamen with the Imperial Guard returned to France.

VII.—Campaign in Russia.

(From Danzig to Königsberg—Crossing of the Niemen—Kovno—Crossing of the Dniéper—Smolensk—Battle of Borodino—Moscow—Crossing of the Bérésina—1812.)

Napoleon, having decided to declare war against Russia, wished once again to take his seamen with him. In the first place, his company of Seamen of the Guard, 200 strong, and a battalion of the Boulogne flotilla, 1,000 strong, were sent in March, 1812, to Magdeburg. A second battalion of 1,000 French and Dutch sailors was taken from Vice-Admiral Ver-Huell's flotilla and sent to Danzig with orders to join Marshal Davout's force. Vice-Admiral Ganteaume was to have the supreme command of the seamen, but as he was too ill to undertake the campaign his place was taken by Captain Baste, who had just attained the rank of rear-admiral. The seamen, well armed and

equipped, directed their steps toward Danzig and Magdeburg, which places became the great victualling centres for the army during this campaign. As before, they were to be attached to the pontoon-train, and, if necessary, to act as combatants. Some naval officers were sent on to arrange for the conveyance of supplies, etc., from Danzig to the Niemen, by way of the Vistula, the Frische-Haff, and Curische-Haff. All the army-corps were sent in the direction of the Niemen, which Napoleon wished them to cross between the 15th and the 20th of June; and on May 9th he left Paris to place himself at the head of the army. By June 12th he was at Königsberg inspecting the arrangements by which the vast supplies were to be conveyed from the depôt at Danzig to the very heart of the Russian provinces; Rear-Admiral Baste, with the Seamen of the Guard, had arranged for the boat service on the rivers after the following fashion:—Boats, which sometimes sailed and sometimes were towed by horses or peasants along the banks, started from the Frische-Haff, whence they proceeded under sail to Königsberg; they then went up the river Prégel as far as Tapiau, and from this point the smallest of the boats were required to transport the supplies through the Deime and the Curische-Haff as far as Memel, and, finally passing through the Frederick Canal, they reached the Niemen at Tilsit. This river was navigable as far as Kovno, at which place the Wilia joins it, and which in its turn was only navigable as far as Vilna. Having congratulated the admiral on the organisation, Napoleon wished to personally superintend the departure of the first convoy carrying 20,000 cwt. of flour, 500,000 rations of biscuits, and 2,000 cwt. of rice. The second convoy started directly afterwards, taking, besides provisions, the siege-trains from Danzig. Rear-Admiral Baste took charge of these arrangements in person. Navigation was not the sole duty of the seamen, however, for they had also to co-operate in defending the fortresses in this locality. On the 15th June the 17th Battalion of the flotilla,[1] which was at Danzig, received orders to proceed without delay to Königsberg. One company of about 100 men was told off for the defence of Pillau. They were given two small gun-boats and three or four large barges, which were supplied with as many oars as they could carry, and ordered, in the first place, to cross at this point from Nehrung to Pillau, then to defend this channel, and, finally, to board all pinnaces and small boats which might attempt to force a passage.

Another company of the same battalion was sent to Memel with the same orders. The six other companies of the battalion were employed, one with the siege-train and the engineers, another with the siege-train of Magdeburg, and the four others were told off for the navigation of the two lakes formed by the Niemen and the Prégel. The fourth battalion of the flotilla[2], which had just arrived with General Eblé, was requisitioned in its entirety for the purpose of constructing bridges. On the 23rd of June the army arrived on the banks of the Niemen, over which General Eblé had been ordered to throw three bridges, and on our troops crossing,

[1] Under the command of Captain Proteau.

[2] Under Captain Bedel du Tertre.

Napoleon took up his quarters at Kovno. General Eblé received orders to proceed to Vilna with his pontoon-train, whilst the Seamen of the Guard with fifty seamen of the 4th Battalion remained at Kovno.

The Russians having abandoned Vilna, Napoleon decided to proceed there; he wished to allow his troops time enough to recover from their fatigue, and also to mature his plans before making another advance. The convoys, which were manned by Seamen of the Guard, made, without difficulty, the journey to Danzig by way of Kovno, but from Kovno to Vilna they had to follow the Wilia, a winding shallow river, the navigation of which was so difficult that it was decided to send the supplies, etc., by road from Kovno to Vilna. Napoleon left Vilna on the 16th of July for Glouboköe, where he made his head-quarters. The seamen were sent in advance with the pontoniers to re-build the bridges and facilitate the progress of the army. A pontoon-train of thirty-two boats, to which was attached a company of seamen, was given to General Kirgener, who formed the advance guard, proceeding in the direction of Vidzy, where he was to place himself under the orders of the King of Naples. Another company of seamen started on the 12th of July from Vilna with Delahorde's division going towards Glouboköe, through Lovarichki, Nickhalichki, and Kobylink. Whilst Marshal Davout, who commanded the 1st Division, gave battle to the Russian Army under Prince Bagration on the glorious field of Mohilew, Napoleon marched on Witebsk to attempt the overthrow of Barclay de Tolly. Two companies of pontoniers and two companies of seamen were again sent forward to Biechenkovitchi to prepare bridges. The Russian Army, always retreating, tried to arrest our victorious progress at Ostrowno, where, in two pitched battles on the 26th and 27th of July, we were again the victors.

Witebsk was occupied, and Napoleon decided to rest there for several days. The want of clothing, and, above all, of shoes, at this point began to make itself felt, and Napoleon wrote to the Duke of Bassano, his minister of foreign affairs at Vilna, to collect all the stores of clothing of the Guard and other corps which had been made at Danzig and Königsberg, and send them to Kovno. Admiral Baste was entrusted with the transport of these stores, and was ordered, at the same time, to send back the siege-train from Magdeburg to Danzig.

Napoleon then resolved to take the offensive, to march from the Dwina to the Dnieper, to follow the left bank of this river as far as Smolensk, and immediately fall upon the Russians, whose flank, by this manœuvre, would be turned. To effect this, General Eblé went in advance with the siege-trains and the seamen, to prepare for the crossing of the army over the Dnieper. When our troops had crossed this river, they advanced to Smolensk by way of Krasnoë, where the first battle was fought. But the Russians, being aware of our movements, marched to Smolensk, and when we arrived before that town we found the whole Russian Army there to defend it. After driving the enemy's outposts into the town, we bombarded it for the whole of one night, and when day

broke the Russians evacuated the place after setting it on fire. Our troops entered the town, the pontoniers and seamen were employed in constructing bridges over the Dnieper, which divides the town into two parts, and by this means our army was able to continue its onward progress. Napoleon pursued the Russian Army as far as Dorogobouge, Wiasma, Ghyat, but was unable to force an engagement on the enemy, as their army always fell back at the critical moment. It was at Borodino that Kutusof, who had taken over the command of the Russian Army, decided to risk a battle, which proved to be one of the most hotly contested of the century. After desperate fighting, the Russians retreated to Moscow, and Napoleon was forced to realise that this battle, which he had hoped would have completely destroyed the enemy's army, was in reality merely a defeat. The Russian Army continued its retreat and marched through Moscow without resting, and when our troops entered the Muscovite capital they found the town abandoned by all its inhabitants. At the same time, a terrible conflagration which had been organised by order of the Governor General Rostopchine, raged in all the quarters of the town and reduced to cinders four-fifths of that ill-fated city. Our soldiers behaved admirably in battling with this disaster, and the Guard was foremost in saving the Kremlin from destruction. When the fire had been got under, Napoleon entered the Kremlin and tried to open negotiations of peace, while the army rested after its exertions. Two companies of Seamen of the Guard had been quartered in the Kremlin, and Napoleon wishing them to be armed in the same manner as the infantry corps, it was decided that each company should be given six 12-pounders and two howitzers, which, with some gun-carriages, had been taken from the arsenal at Moscow, and thus the Reserve of the Guard was augmented to sixteen guns.

Receiving no answer from St. Petersburg, and learning, moreover, of the approach of a fresh army under Admiral Tchitchakof's command, Napoleon decided to beat a retreat. We will not follow the army in the horrors of its retreat from Russia. Harassed by the enemy, weakened by the severities of the climate, without clothing or food, our soldiers' corpses strewed the ground. The Guard itself saw its effective strength diminish; yet, always rising superior to its difficulties, it set an example of obedience and discipline which was much needed. The seamen were especially distinguished for their conduct at the crossing of the Bérésina for the aid they gave to the pontoniers under General Eblé. When La Grande Armée reached Kovno on the 11th December, they benefitted considerably by the supplies which, thanks to the activity and forethought of Admiral Baste, had been got together from Danzig. Bad news reached them from France, and Napoleon, considering his presence in Paris indispensable, left the army under the command of Murat, King of Naples, and began the organisation of a fresh army of 300,000 men, at whose head he hoped soon to return.

VIII.—The Prussian Campaign—The French Campaign—The Island of Elba—Waterloo.

(Lützen—Bautzen—Leipsic—The Battle of Brienne—Battle of Paris—First Abdication—Fontainebleau—The Island of Elba—Return from the Island of Elba—Waterloo—Second Abdication.)

A new coalition was formed against France, and threatened our army on our return from Russia. One by one our allies abandoned us, and there was no other course open to Napoleon but to form a fresh army and restore the prestige of our troops.

In the month of February, 1813, Admiral Baste was sent into Swedish Pomerania, under General Morand's orders, to take the command of a flotilla there and organise the defence of the Island of Rügen and the surrounding coast. The three battalions of Seamen of the Guard which had returned from Russia had suffered considerable losses, so Napoleon decided to make from them one complete company and attach them to the 1st Division of the Young Guard, which was to be under the command of General Barrois. The two other battalions were reformed, one from the squadron at Brest, the other from that at Toulon, only picked men from the several vessels at these ports being selected to join this *corps d'élite*. Besides the Seamen of the Guard, two crews of the flotilla had taken part in the recent campaign, and had then been employed to garrison Pillau. These two battalions were ordered to Erfurth, and from there to Wurzburg, where they were placed under Marshal Ney's orders, who was now commanding the 3rd Division of La Grande Armée.

The seamen were once more destined to cover themselves with glory.

At Lützen, at the time of the attack on Kaja by the Prussian Guard, the seamen of Bonnet's division formed square and, placed in the foremost lines, withstood the fire of the artillery and the charges of the cavalry without ever giving ground.

At Bautzen, the 4th Division of the infantry, also under Bonnet, not only withstood a charge of Blücher's cavalry with the utmost fortitude, but also, supported by the 37th Light Infantry, drove General Kleist's foot soldiers into ignominious retreat.

This second victory had its due effect upon our allies, and the result was a proposal for an armistice, which was signed on the 4th June, 1813.

During the time that *pourparlers* were being held, which were only to end in the continuation of the war, Napoleon established his lines on the banks of the Elbe, and gave his attention to the defence of his works and the victualling of his army in that part.

By the exertions of the Seamen of the Guard, all the boats that could be found were manned and employed in taking the sick and wounded to Magdeburg, which place was turned into a vast hospital, and, on their return journey, these boats took cargoes of victuals and such arms and guns as that place could supply. Immense supplies of provisions, which came from Hamburg, were distributed to all the fortified places on

the Elbe, and in August the treaty of peace was broken, Austria declared war against us, and joined forces with the Allied Powers.

It was at Leipsic that the decisive battle was fought, when, notwithstanding their prodigious valour, our soldiers were obliged to fall back before the united forces of Prussia, Russia, Austria, and Sweden. Our allies, headed by the Saxons, abandoned us on the battle-field and went over to the enemy's side. As at Lützen and Bautzen, the seamen were engaged and fought like lions. Then came the invasion, the march of the enemy's troops on Paris, who were stopped at each step by the fresh victories of Napoleon, who himself displayed in that campaign the magnificent genius of which in former days he had given such evidence in Italy. Unfortunately, the forces were not equal in number, and when the armies of the Allied Powers arrived in Paris they were hailed as saviours, for everyone was by this time tired of the Emperor's mode of governing and his continual wars. During the whole of this campaign, the Seamen of the Guard continued to prove themselves heroes. Their leader, the gallant Admiral Baste, who had been given the command of an infantry brigade, was killed on the 29th of January, 1814, in the terrible battle of Brienne.

La Rothière, Champaubert, Montmirail, Château-Thierry, Vauchamp and Montereau were the scenes of more battles, where our troops, though it cost us dearly, remained the victors. We had no pontoon-train here, and it was only through the hard work and great activity of the Seamen of the Guard, on the night of the 4th of March, that the means of crossing over the Marne was re-established. Having crossed this river, Napoleon decided to march towards Nancy, where he expected to be joined by the garrisons of the Eastern fortresses, and then to fall on the enemy's rear. But the latter continued his forward march, and on the 30th of March the battle of Paris was fought. It was the most disastrous of all the engagements, and resulted in the capital falling into the enemy's hands. Napoleon arrived too late, and overwhelmed by the discontent, cowardice, and treachery of those he trusted most, he decided to abdicate. On the 18th of April, at Fontainebleau, he bade adieu to his Guard, and departed to the Island of Elba, which the sovereigns of the Allied Powers were kind enough to offer him as a kingdom! He took with him 724 men of the Old Guard, comprising about 600 grenadiers and riflemen, 100 cavalrymen and twenty seamen. The Imperial Guard became the Royal Guard, and the seamen were disbanded.

The extraordinary series of brilliant exploits on the return of Napoleon to Paris is too well known to render a repetition from us in any way necessary. We will only recall that, leaving the Island of Elba on the 26th of February, 1815, Napoleon arrived in the Gulf of Juan on the 1st of March, and the numbers of his little army were daily augmented by those very troops which had been sent against him. His faithful seamen marched in the van under General Cambronne, who had with him three companies of riflemen and some mounted and unmounted Polish lancers.

On the 20th of March, Napoleon entered the Tuileries, and the Empire was re-established. The Emperor's first thought was to re-organise his army, knowing that before long he would have to fight again.

The Imperial Guard, which he had re-established by decree on the 13th of March during his march towards Paris, was definitely re-formed by the 8th of April. The seamen who had been disbanded after his abdication were re-established on the 8th of May. War was inevitable. Foreign troops were nearing our frontiers, and Napoleon, who had returned from Elba with projects of a peaceful government, was obliged to once more take his troops to the field.

They started in the direction of Belgium, where the coalition appeared the most threatening, and he himself took his place at the head of his soldiers. On the 15th of June the army commenced to move. The Seamen of the Guard with the pioneers and engineers marched with the 3rd Division, which was commanded by General Vandamme, and were more particularly placed under the orders of Generals Rogniat and Haxo.

These troops were not intended to fight, but were employed in the work necessitated by crossing rivers, building bridges, and repairing the roads and means of communication. This 3rd Division suffered some delay at Beaumont. After an altercation between Generals Vandamme and Rogniat, the latter decided to proceed, with the engineers and Seamen of the Guard, under the protection of General Pajol's cavalry. He took possession of the bridge at Charleroi, before the enemy had time to destroy it, and, blowing up the gates of the town, entered it. But in spite of the courage and heroism of our soldiers, fate was against us; and the all-glorious day at Ligny only raised our hopes of greater victories for a moment, as three days later, at Waterloo, we were completely overwhelmed and annihilated by the enemy's superior forces.

Napoleon was defeated, and for the second time forced to abdicate; and while he took the road into exile, the remnants of his army were consigned to the care of General Davout and sent behind the Loire. The Imperial Guard was dissolved, and the Seamen of the Guard disbanded for the second time. This *corps d'élite* was never re-established, but the brilliant deeds with which it had rendered illustrious its short existence suffice to immortalise it, and inscribe its name in letters of gold in the glorious archives of the military and naval history of France.

H. G.

NAVAL AND MILITARY NOTES.

NAVAL.

HOME.—The following are the principal appointments which have been made: Rear-Admirals—A. T. Dale to command of Particular Service Squadron; E. Rice to be Admiral-Superintendent of Portsmouth Dockyard. Captains—F. S. Inglefield to "Bonaventure"; the Hon. A. G. Curzon-Howe, C.B., to "Revenge"; B. Watson to "Royal Oak"; H. F. Hughes-Hallett to "Gibraltar"; C. Campbell, C.B., to "Theseus"; C. R. Arbuthnot to "Hermione"; J. M. McQuhae to "Charybdis"; J. L. Hammett to "Wildfire" as Flag-Captain to Commander-in-Chief, Sheerness; Orford Churchill to "Nile"; H. W. S. Gibson to "Thunderer." Commanders—Conyers Lang to "Medusa"; C. R. Keppel to "Skipjack"; R. H. Travers to "Lynx"; F. G. Langdon to "Black Prince"; T. Y. Greet to "Lion"; Cecil Burney to "Boscawen."

The new Particular Service Squadron consists of two first-class battle-ships of the "Royal Sovereign" type, the "Revenge," which carries the flag of Rear-Admiral Dale, and the "Royal Oak"; two first-class cruisers, the "Theseus" and "Gibraltar"; two second-class cruisers, the "Hermione" and "Charybdis," and six of the new torpedo-boat destroyers, one being attached to each ship. The squadron is a powerful and homogeneous one, as even the two second-class cruisers, owing to their being of the improved 320-feet long class, should be able to maintain the same speed, even in bad weather, as the four larger ships. The commissioning of this new Squadron is of importance, as it has been proved that, besides the advantages accruing through having so many more officers and men undergoing training in a sea-going squadron, the ships themselves will become much more efficient than if they had remained rusting in the Steam Basins.

The following twelve torpedo-boat destroyers have been commissioned for service with the Channel and Special Service Squadrons:—"Lightning," "Surly," "Handy," "Havock," "Salmon," "Sturgeon," "Rocket," "Shark," "Hart," "Snapper," and "Skate."

During the time the torpedo-boat destroyers are cruising with the squadrons, they are to be regarded as convoys, each having a sea-going depôt, known as the "parent ship." They have already been allotted to their respective parent ships, the arrangements being as follows :—

CHANNEL SQUADRON.

Destroyer.	*Parent Ship.*
"Lightning"	"Majestic"
"Surly"	"Magnificent"
"Handy"	"Resolution"
"Havock"	"Royal Sovereign"
"Salmon"	"Empress of India"
"Sturgeon"	"Repulse"

PARTICULAR SERVICE SQUADRON.

"Shark"	"Royal Oak"
"Hart"	"Gibraltar"
"Snapper"	"Theseus"
"Skate"	"Charybdis"
"Rocket"	"Hermione"
"Starfish"	"Revenge"

The third-class cruiser "Pallas" has left for the West Indies, and made a very successful commissioning trial under natural draught before starting, the engines developing 4,490-I.H.P. without pressing, and the ship maintaining a mean speed of 16 knots.

The new sloop "Phœnix" has completed her official speed trials at Plymouth. The natural-draught trial was so satisfactory that it was fully anticipated by the dockyard engineers that her forced-draught trial would give at least another knot of speed. This expectation, however, was not realised, for, notwithstanding the increased I.H.P., the speed recorded at the forced-draught trial was precisely the same—13·4 knots. The mean results for the four hours' steaming with the forced draught were :—Steam, 149 lbs. ; vacuum, starboard 26·1 inches, port 24·9 inches ; revolutions, starboard 196, port 204 ; I.H.P., starboard 752, port 739—total 1,491 ; air pressure, 1·14 inches; speed, by log, 13·4 knots. During the trial the vessel's guns and gun mountings were tested. She is armed with six 4-inch Q.F. guns and four 3-pounder Hotchkiss guns, and several rounds were fired from each weapon. The 4-inch gun is a new type only recently introduced into the Service ; the gun worked splendidly, the loading, training, and elevating gear giving great satisfaction.

The torpedo-boat destroyer "Sunfish" has also completed her trials. The contract stipulated for a speed of 27 knots maintained for three consecutive hours, and this the builders have more than achieved. The average for three hours gave 27·581 knots. The mean speed for six runs over the measured mile on the Maplin was 28·082 knots. Going with wind and tide the maximum speed was equivalent to more than 30 knots—close upon 34 miles an hour. The mean steam pressure in the boilers was 188 lbs. per square inch, and the mean revolutions were 351·2 per minute. The average I.H.P. developed by the engines during the trials was 4,174. The machinery worked smoothly and well, and the steaming of the boilers was in all respects satisfactory, whilst the consumption of coal was moderate.

The keel plates of the new second-class cruisers "Vindictive" and "Gladiator" were laid on the 27th ult., at Chatham and Portsmouth respectively. Both vessels are to be pushed on as rapidly as possible, and it is hoped to complete them in a year.

A few weeks since it was announced that the Admiralty had decided to re-boiler

the third-class cruiser "Bellona," and to substitute for her present boilers a set of the water-tube type. The Thornycroft pattern has since been selected, and Keyham Dockyard is now engaged in making a complete set from designs furnished by the patentees for the cruiser "Proserpine." The adoption of this class of boiler is to be still further extended, arrangements having been made to supply them to the third-class cruiser "Barham," now employed on the Mediterranean station, from which service she will be relieved at the beginning of the next financial year, in order that the work of reboilering her may be taken in hand.

Hitherto the torpedo-boat destroyers have been supplied with electricity for the search lights only, but this means of lighting is now to be introduced in the engine and boiler rooms, ten lights being allowed the "Daring" and nine the other boats. The cabins and other apartments are still to be lighted with ordinary lamps. The objection to the electric lighting of the boats has been that their rolling might damage the apparatus, but this objection has now been overruled. All the destroyers commissioned for service with the Channel and Particular Service Squadrons have been fitted with the electric light for their engine and boiler rooms.

The Admiralty have invited the principal private shipbuilding firms in the country to tender for the construction and immediate commencement of five third-class cruisers. These new vessels will be of similar design to the "Pelorus," about to be launched at Sheerness. They will be 300 feet long and of about 3,000 tons displacement, with engines of 7,000-I.H.P., which are estimated to give them a speed of 20 knots. The boilers are to be on the water-tube principle, and the proposed armament, which is heavy for their size, will be wholly composed of Q.F. guns. The contracts for these vessels will be divided amongst the five successful firms tendering in groups, of two ships to each firm. It is anticipated that all five vessels will be completed for service in a little over twelve months.

An abstract of returns of the rifle practice carried out in Her Majesty's fleet during the past twelve months shows results far more successful than has hitherto been attained. The most remarkable record is that of the "Beagle," on the South-East Coast of America. All her petty officers and seamen (executive branch), numbering fifty-six, took part in the practice, and in no case was the score less than 165 points, so that in addition to all the men being qualified marksmen, each one is a prize winner and entitled to wear the marksman's distinctive badge. Out of a maximum of 240 points, the average score of the "Beagle's" men is 191·1. The best shot in the naval service is first-class Petty Officer B. Phillips, of the cruiser "Hawke," who heads the lists with 222 points. The squadron results are as follows :—

Name of Squadron.	Average points obtained in individual firing.	Number who competed.
South-East Coast of America	178·21	123
Mediterranean	161·52	3,844
East Indies	161·18	142
Coastguard Service	151·67	784
Cape and West Coast of Africa	148·0	129
Australia	143·58	982
Channel Squadron	138·0	1,451
North America and West Indies	133·52	107
China	133·57	272

A striking fact in connection with the shooting is that throughout the whole practice the Martini-Henry rifle only was used. This year's returns will give mixed results, as several of the ships will have been provided with the Lee-Metford magazine rifle before the practice takes place, whilst in 1897 all the practice will be with the new rifle.—*Naval and Military Record* and *Times*.

The following return of seagoing war-ships in commission, in reserve, and building, and the naval expenditure, revenue, tonnage of mercantile marine, and value of seaborne commerce of various countries for the year 1894, with a return showing naval expenditure on seagoing force, the value of seaborne commerce (exclusive of interchange with the United Kingdom), and the revenue of British self-governing colonies for the year 1894, has been issued as a Parliamentary Paper. These returns are in continuation of Parliamentary Papers, No. 396, of Session 1890-91; and of No. 372, of Session 1893; and of No. 299, of Session 1894:—

SEAGOING WAR-VESSELS.

Countries	In Commission				In Reserve				Building and Completing for Sea			
	Battle-ships	Coast-Defence Ships (Armoured)	Cruisers (Armoured and Unarmoured)	Other Ships not Torpedo-boats	Battle-ships	Coast-Defence Ships (Armoured)	Cruisers (Armoured and Unarmoured)	Other Ships not Torpedo-boats	Battle-ships	Coast-Defence Ships (Armoured)	Cruisers (Armoured and Unarmoured)	Other Ships not Torpedo-boats
British Empire—												
United Kingdom	26	4	64	79	16	10	56	44	10	—	11	43
India (i)	—	1	—	1	—	1	—	1	—	—	—	—
Self-governing Colonies (h)	—	—	4	1	—	1	2	5	—	—	—	—
Other Colonies	—	—	—	—	—	—	—	—	—	—	—	—
Total British Empire ...	26	5	68	81	16	12	58	50	10	—	11	43
France	16	3	29	29	9	11	22	10	9	—	18	4
Russia	4	2	6	12	6	12	8	20	7	4	3	6
Germany	12	2	15	6	8	11	12	6	3	—	6	—
Italy	8	—	8	11	5	—	9	22	2	—	6	5
Spain	1	—	10	45	—	1	2	5	1	—	5	4
Austria-Hungary... ...	3	—	4	7	5	—	8	14	—	3	—	—
Netherlands	—	9	5	36	1	10	5	24	—	3	3	1
Portugal	1	—	2	23	—	—	—	6	—	—	—	—
United States	—	1	16	9	—	18	6	8	8	1	1	10
China	—	1	6	59	—	—	—	—	—	—	—	1
Japan	1	—	19	10	1	—	2	11	2	—	3	—
Chili	1	1	4	3	—	1	2	3	—	—	1	—
Brazil	1	1	4	12	1	1	—	2	—	2	—	—
Argentine	3	2	3	9	—	—	—	4	—	—	2	—

Countries	Aggregate Naval Expenditure	Aggregate Revenue	Aggregate Tonnage, Mercantile Marine (Vessels of 100 tons gross and upwards)	Value of Seaborne Commerce,* including Bullion and Specie
British Empire :—	£	£	Tons.	£
United Kingdom ...	16,328,117 (n) (1893-94)	91,133,410 * (1893-94)	12,117,957 (1894)	748,521,041 (1894)
India (i) ...	972,985 (a) (o) (1893-94)	60,376,810 (a) (1893-94)	50,745 (net) † (1894)	66,701,526(a) (b) (1893-94)
Self-governing Colonies (h)	220,216 ‡ (l) (1892-93)	42,473,954 * (1893)	938,476 (net) † (1894)	83,949,104 (b) (1893)
Other Colonies	—	6,202,722 * (1893)	120,007 (net) † (1894)	55,313,920 (b) (1893)
Total British Empire ...	17,521,318	200,186,896	13,227,185	954,485,591
France ...	10,825,040	130,074,474 (1891-92)	1,094,752 (1894)	294,753,414 (1892)
Russia ...	5,114,569	118,025,000 * (1892)	487,681 (1894)	69,665,220 (p)
Germany ...	4,318,125	70,695,000 * (1891-92)	1,886,812 (1894)	150,693,600 (d) (1892)
Italy	3,845,690	69,368,397 * (1893)	778,941 (1894)	44,286,349 (1892)
Spain	937,746	28,295,927 * (1892-93)	554,238 (1894)	55,105,106 (1892)
Austria-Hungary ...	1,081,766	102,490,417 (1892)	304,970 (1894)	24,063,580(d) (p) (1892)
Netherlands ...	1,284,356	10,562,366 (1893)	446 861 (1894)	53,372,574 (p) (1892)
Portugal ...	649,944	9,863,627 (1893-94)	103,620 (1894)	21,191,000 (c) (1892)
United States	5,073,365	152,682,000 * (1893)	994,675 (net) † (1892) (f)	393,393,736 (1892)
China	?	15,000,000 (e)	19.172 (1894)	52,757,000 (c) (1892)
Japan	1,127,974	15,219,286 (1892-93)	301,101 (1894)	29,174.000 (1892)
Chili	50,221	3,814,109 (1893)	103,085 (1894)	32,324,000 (1892)
Brazil	1,592,740	28,532,410 (1893)	148,769 (1894)	31,304,108 (c) (1890)
Argentine ...	529,427	15,842,966 (1893)	62,278 (1894)	41,746,860 (1892)
		From the "Statesman's Year-Book." Those marked * from Board of Trade Returns. Figures for France and Brazil from "Whitaker's Almanac."	From "Lloyd's Universal Register." Those marked † from Board of Trade Returns.	From Board of Trade Returns. Figures for Brazil from the "Statesman's Year-Book."

REMARKS.

a. Converted into sterling at the rate of 1s. 4d. the rupee.

b. Excluding trade with the United Kingdom, and necessarily counting inter-colonial trade twice over.

c. Total trade.

d. Approximate only, the returns make no distinction between seaborne and overland trade.

e. Estimated normal revenue.

f. Does not include vessels engaged in lake, river, and home trade.

g. Includes Border trade.

h. Includes Her Majesty's vessels for protection of floating trade in Australasian waters.

i. Includes Her Majesty's ships and vessels for the naval defences of India.

k. There are no returns for Hong-Kong, Gibraltar, and Malta. The trade of Hong-Kong with countries other than the United Kingdom is estimated at upwards of £40,000,000.

l. From the "Victorian Year Book, 1893."

m. All figures for the commerce and revenue of the colonies are from Board of Trade Returns.

n. Of this total, £15,297,425 was ordinary expenditure; and £1,030,692 was expenditure under the Naval Defence Fund (outside Navy votes).

o. Includes a contribution of £50,000 for Her Majesty's ships in Indian waters, and £61,053 (including £1,453 balance of subsidy for 1892-93) for Her Majesty's ships and vessels for the naval defence of India. The amount to be paid under the last head will in future be £59,600 annually. The balance represents expenditure on the Royal Indian Marine. The question as regards the contribution on account of Her Majesty's ships in Indian waters is now settled, and the payment on account of this service will be £117,000 for 1895-96, and thenceforward £100,000 annually.

p. Imports for home consumption and exports of domestic produce only are shown in Board of Trade Returns.

NAVAL EXPENDITURE ON SEAGOING FORCE, THE VALUE OF SEABORNE COMMERCE (EXCLUSIVE OF INTERCHANGE WITH THE UNITED KINGDOM), AND THE REVENUE OF BRITISH SELF-GOVERNING COLONIES FOR THE LATEST YEAR FOR WHICH INFORMATION IS AVAILABLE.

Colonies	Naval Expenditure on Seagoing Force ‡ (i)	Year	Value of Seaborne Commerce*, exclusive of Interchange with United Kingdom (m)	Year	Revenue (m)	Year
British North America—	£		£		£	
Canada	—	—	11,360,751 (d)	1893	7,842,865	1893
Newfoundland ...	—	—	2,054,996	,,	365,384	,,
Total	—	—	13,415,747 (b)	—	8,208,249	—
British South Africa—						
Cape Colony	—	—	2,874,546	1893	4,971,214	1893
Natal	—	—	1,037,503	,,	1,069,678	,,
Total	—	—	3,912,049 (b)	—	6,040,892	—
Australasia—						
New South Wales ...	82,306	1892-93	25 540,627 (g)	1893	9,499,814	1893
Victoria	80,757	,,	13,589,826 (g)	,,	6,959,229	,,
Queensland	25,948	,,	8,731,426 (g)	,,	3,343,069	,,
South Australia ...	22,913	,,	11,269,243 (g)	,,	2,737,114	,,
Western Australia ...	3,360	,,	1,330,604 (g)	,,	570,651	,,
New Zealand	?	,,	4,378,409	,,	4,407,964	,,
Tasmania	4,932	,,	1,781,173	,,	706,972	,,
Total	220,216	—	66,621,308 (b)	—	28,224,813	—
Grand total... ...	220,216	—	83,949,104 (b)	—	42,473,954	—

‡ (l) Includes contributions towards the maintenance of Her Majesty's vessels for protection of floating trade in Australasian waters, as follows :—

New South Wales	£69,471 (including arrears).
Victoria	37,238
Queensland	13,260
South Australia	10,527
Western Australia	3,360 (two years).
New Zealand	?
Tasmania	4,938
Total	£138,794

The annual contribution is £126,000 payable in advance. It was apportioned amongst the various colonies on a population basis, for the year commencing 1st March, 1893, as follows :—

New South Wales	£37,730
Victoria	36,968
Queensland	13,342
South Australia	10,663
Western Australia	1,858
New Zealand	20,599
Tasmania	4,850
Total	£126,000

* Annual value of imports and exports by sea.

General.

The war-ships, exclusive of torpedo-boats, launched during the year 1894 for the various navies, with their tonnage, I.H.P., and estimated speed were as follows :—

Great Britain.—First-class battle-ships :—"Majestic," "Jupiter," "Prince George," and "Victorious," all of 14,900 tons, 12,000-I.H.P., and 17 knots speed; "Renown," 12,350 tons, 12,000-I.H.P., 17 knots. First-class cruisers:—"Powerful" and "Terrible," 14,200 tons, 25,000-I.H.P., 22 knots. Second-class cruisers :—"Diana," "Juno," "Minerva," "Talbot," and "Venus," 5,600 tons, 9,600-I.H.P., 19 knots. Sloops :—"Algerine," "Phœnix," 1,050 tons, 1,400-I.H.P., 13 knots. Torpedo-boat destroyers :—"Quail," "Sparrowhawk," "Thrasher," and "Virago," 300 tons, 6,000-I.H.P., 30 knots; "Bruiser," "Conflict," "Fervent," "Handy," "Hardy," "Hasty," "Haughty," "Janus," "Lightning," "Opossum," "Porcupine," "Ranger," "Salmon," "Skate," "Snapper," "Spitfire," "Sunfish," "Swordfish," "Teazer," "Wizard," "Zebra," and "Zephyr," 260 to 280 tons, 3,600 to 4,500-I.H.P., 27 knots.

Argentine Republic.—First-class armoured-cruiser :—"José Garibaldi," 6,840 tons, 14,000-I.H.P., 20 knots. First-class protected-cruiser :—"Buenos-Aires, 4,500 tons, 17,000-I.H.P., 23 knots.

Austria-Hungary.—Coast-defence armoured-ships :—"Monarch" and "Wien," 5,550 tons, 8,500-I.H.P., 17 knots.

China.—Torpedo-cruiser :—"Fei-Ying," 850 tons, 4,500-I.H.P., 22 knots.

France.—First-class battle-ships :—Charlemagne," 11,275 tons, 14,500-I.H.P., 18 knots; "Masséna," 11,900 tons, 13,600-I.H.P., 18 knots. First-class armoured-cruiser :—"Pothuau," 5,360 tons, 10,000-I.H.P., 19 knots. Second-class cruisers :—"Pascal," 3,988 tons, 8,500 I.H.P., 19 knots; "Du Chayla," 3,952 tons, 9,500-I.H.P., 20 knots. Torpedo-depôt ship :—"Foudre," 6,090 tons, 11,500-I.H.P., 18 knots. Torpedo-aviso :—"Casabianca," 964 tons, 5,000-I.H.P., 22 knots. Gun-boat :—"Surprise," 629 tons, 900-I.H.P., 13 knots.

Germany. — Fourth-class coast-defence armoured-ship: — "Ægir," 3,499 tons, 4,800-I.H.P., 16 knots. Despatch-vessel :—"Hela," 2,003 tons, 5,400-I.H.P., 23 knots.

Haytian Republic. — Third-class cruiser :—"Crête-à-Pierrot," 1,000 tons, 3,000-I.H.P., 16 knots.

Italy.—First-class armoured-cruiser :—"Vettor Pisani," 6,500 tons, 13,000-I.H.P., 20 knots.

Japan.—Third-class cruiser: — "Suma," 2,700 tons, 8,500-I.H.P., 20 knots. Torpedo-cruiser :—"Akashi," 875 tons, 5,500-I.H.P., 21 knots.

The Netherlands. — Coast-defence armoured-ship: — "Kortenaer," 3,400 tons, 4,550-I.H.P., 16 knots.

Portugal.—Gun-boat :—"Dom Luiz I.," 721 tons, 600-I.H.P., 10 knots.

Russia. — First-class battle-ship: — "Sevastopol," 10,960 tons, 10,600-I.H.P., 17 knots. Armoured-gun-boat :—"Khrabri," 1,492 tons, 2,000-I.H P., 15 knots. Training-corvette : — "Vierny," 1,280 tons, 400-I.H.P., 10 knots. Torpedo-boat destroyer: — "Sokol," 240 tons, 3,700-I.H.P., 30 knots. Imperial yacht :—"Standart," 5,557 tons, 10,600-I.H.P., 20 knots.

Spain.—First-class battle-ship :—"Carlos V." 9,235 tons, 15,000-I.H.P., 20 knots. Gun-boats :—"Herman Cortes," "Pizarro," "Vasco Nunez," "Quiros," 300 tons, 600-I.H.P., 13 knots.

United States.—Coast-defence monitor :—"Amphitrite," 3,990 tons, 1,600-I.H.P., 12 knots. First-class armoured-cruiser : — "Brooklyn," 9,271 tons, 1,600-I.H.P., 20 knots. Gun-boats: — "Wilmington," "Helena," and "Nashville," 1,371 tons, 1,750-I.H.P., 14 knots.

Brazil, Chili, Denmark, Sweden and Norway, Greece, and Turkey launched no vessels last year.

The following ships were laid down during the past year :—

Great Britain.—First-class battle-ships:—"Cæsar," "Hannibal," "Illustrious," and "Mars," 14,900 tons, 12,000-I.H.P. First-class cruisers: — "Andromeda," "Diadem," "Europa," and "Niobe," 11,000 tons, 20,000-I.H.P., 22 knots. Second-class cruisers :—"Arrogant," "Furious," "Gladiator," and "Vindictive," 5,750 tons, 10,000-I.H.P., 20 knots. Third-class cruisers : — "Pelorus" and "Proserpine," 2,130 tons, 9,000-I.H.P., 22 knots; and several torpedo-boat destroyers. The year in Great Britain has been taken to mean the financial year ending on 31st March; three of the first-class and two of the second-class cruisers were only actually commenced in January; for other countries the normal year is taken, as it is the financial year with them.

Argentine Republic.—First-class cruiser :—"San Martin," 4,000 tons, 17,000-I.H.P., 23 knots. Torpedo-boat destroyers :—One of 30 knots, and six of 27 knots.

Brazil.—Third-class battle-ships :—Three of 3,162 tons, 4,000-I.H.P., 16 knots.

France.—First-class battle-ships : — "St. Louis" and "Gaulois," 11,275 tons, 14,500-I.H.P., 18 knots. First-class cruisers : — "Guichen" and "Châteaurenault," 8,600 tons, 26,000-I.H.P., 23 knots. Second-class cruiser :—"Amiral-Protet," 4,110 tons, 9,000-I.H.P., 19 knots. Third-class cruisers :— "D'Estrées" and "Infernet," 2,000 tons, 4,200-I.H.P., 17 knots. Despatch-vessel : — "Kersaint," 1,300 tons, 2,200-I.H.P., 15 knots. Torpilleurs-de-haute-mer : — "Mangini" and "Ténare," 130 tons, 2,000-I.H.P., 25 knots.

Germany. — First-class battle-ship: — "Friedrich-Wilhelm," 11,000 tons, 13-000-I.H.P., 18 knots. First-class cruiser :—Ersatz "Leipsig," 10,300 tons, 13,000-I.H.P., 21 knots. Second-class cruisers :—"K" and "L," 6,000 tons, 10,000-I.H.P., 21 knots. Torpilleurs-de-haute-mer :—Four of 25 knots.

Italy.—First-class battle-ships:—"Amiral di Saint Bon," and "Emanuele-Filiberto," 9,800 tons, 13,500-I.H.P., 18 knots. Torpedo-ram-cruisers:—"Principe di Napoli" and "Reina Margherita," 2,500 tons, 7,550-I.H.P., 19 knots. Third-class cruisers:—"Puglia," 2,550 tons, 7,000-I.H.P., 20 knots; "Agordat" and "Coatit," 1,313 tons, 5,000-I.H.P., 23 knots. Torpedo-boat destroyer:—One of 28 knots.

Japan.—First-class battle-ships:—"Fuji-Yama" and "X," 12,450 tons, 13,500-I.H.P., 18 knots. Third-class cruiser:—"Arasaki," 2,700 tons, 8,500-I.H.P., 20 knots. Torpedo-cruiser:—"Shirane," 875 tons, 5,500-I.H.P., 21 knots.

The Netherlands.—Second-class cruisers:—"Friesland," "Holland," and "Zeeland," 3,900 tons, 9,250-I.H.P., 20 knots.

Norway.—Coast-defence battle-ships:—"A" and "B," 3,400 tons, 4,000-I.H.P., 15 knots.

Portugal.—Third-class cruiser:—"Adamastor," 2,000 tons, 4,000-I.H.P., 17·5 knots.

Russia.—First-class battle-ships:—"Peresviet" and "Oslaba," 12,000 tons, 14,000-I.H.P., 18 knots. Coast-defence battle-ship:—"Admiral-Apraxine," 4,126 tons, 5,000-I.H.P., 16 knots. Third-class cruiser:—"Svetlana," 3,800 tons, 8,500-I.H.P., 20 knots. Armoured gun-boat:—"Khrabri," 1,492 tons, 2,000-I.H.P., 15 knots. Training-corvette:—"Vierny," 1,280 tons, 400-I.H.P. Torpilleurs-de-haute-mer:—Three of 120 tons, 1,400-I.H.P., 25 knots.

Spain.—Third-class cruiser:—"Reina-Regente." Torpedo-boat destroyers:—"Cristobal-Colon" and "Barcaiztegui."

Sweden—Coast-defence battle-ship:—"Oden," 3,325 tons, 3,700-I.H.P., 16 knots.

United States.—First-class battle-ships:—"Kearsage" and "Kentucky," 11,500 tons, 10,000-I.H.P., 16 knots. Gun-boats:—Six, Nos. "10" to "15," 1,000 tons, 800-H.P., 12 knots. Torpedo-boat destroyers:—Two of 27 knots, and six first-class torpedo-boats.

FRANCE.—The following are the principal appointments which have been made: Capitaines de Vaisseau—Le Dô to the command of the Naval Division in the East Indies; Couy to "Bretagne"; Massé to "Hoche"; Cordier to "Amiral-Charner"; Puech to "Brennus"; De Fauque de Jonquières to "Bouvines." Capitaines de Frégate:—Lacourné to "Lapérouse"; Imhoff to "D'Iberville"; Berryer as Chief of the Staff to Rear-Admiral Fournier.—*Le Moniteur de la Flotte.*

Captain Le Dô will temporarily hoist his broad pennant on board the third-class cruiser "Primauguet," when he relieves Rear-Admiral Bienaimé; the third-class cruiser "Lapérouse," however, commissioned on the 1st inst., at Toulon to relieve the "Primauguet," which will return to Toulon to pay off. The new first-class battle-ship "Brennus" made on the 10th ult. another full-speed run at Brest, with the following results:—I.H.P., 14,060; mean number of revolutions, 92·4; coal consumption per H.P. per hour ·991 kilogramme; mean speed realised, 17·1. This trial is the most satisfactory the ship has made yet; she has now arrived at Toulon from Brest, and she made a successful twenty-four hours' full-speed run under natural draught *en route*, averaging 16 knots. The Active Squadron of the Mediterranean fleet is expected at Toulon about the middle of the month, and Vice-Admiral Gervais will then transfer his flag from the "Formidable" to the "Brennus," the former ship being placed in the second

category of the Reserve at Toulon. Vice-Admiral de Prémesnil, commanding the Northern Squadron, transferred his flag to the "Hoche" on the 1st inst. from the "Suffren," which ship will be paid off and placed in the third category of the Reserve at Brest, and on the 10th inst. Rear-Admiral de Courthille hoisted his flag on board the new coast-defence battle-ship "Bouvines," in succession to Rear-Admiral Ménard, as second in command of the squadron. The first-class battle-ship "Amiral-Duperré," at present flying the flag of Rear-Admiral Turquet de Beauregard, second in command of the Reserve Squadron of the Mediterranean fleet is to take the place of the third-class battle-ship "Trident" as flag-ship of the Commander-in-Chief of the Squadron, the second-class battle-ship "Friedland" being commissioned as the flag-ship of the Rear-Admiral. The new battle-ship "Jauréguiberry" was commissioned on the 23rd ult. at Toulon with a reduced crew for her trials, which are looked forward to with much interest, as she is the first battle-ship in which electricity has been fitted as the motive power for the turrets, guns, ammunition hoists, etc.

The "Amiral-Duperré" is to carry out some experiments with shells charged with a new high explosive called crésylite, a powerful explosive, which it is expected will supersede melinite for charging shells supplied for service to ships in the fleet.

The armoured first-class cruiser "Dupuy-de-Lôme" now at Brest, is to have her 16-centimetre (6·3-inch) Q.F. guns of the 1887 model changed for the newest type made in 1893. The difference is in the chambering, the latest pattern fire a charge of 13·6 kilogrammes of powder, giving an initial velocity of 2,822 feet-seconds, as against a charge of 11·6 kilogrammes, giving a muzzle velocity of 2,461 feet-seconds.

The new torpedo-aviso "Cassini" has had to return to the dockyard hands again at Cherbourg; while undergoing her final twenty-four hours' run at full-speed under natural draught, one of the blades of her screws, which are four-bladed and made of bronze, broke off; this was the more unfortunate as the vessel had completed twenty-two out of the required twenty-four hours' trial.

The new second-class cruiser "Descartes" is expected at Brest from Saint-Nazaire to undergo her trials. According to the official programme for the present quarter of the year, the new gun-boat "Surprise" is to commission on the 1st March to replace the "Lutin," an older vessel of the same type in China, which will pay off and be placed in Reserve at Saigon; the "Cassini" after her trials is to be attached to the Squadron of the North, as is also the new coast-defence battle-ship "Amiral-Tréhouart." The new torpedo-aviso "Casabianca" at Rochefort is, after the completion of her trials, to join the Active Squadron of the Mediterranean fleet; the torpedo-cruiser "Condor," which has lately received new boilers and undergone a thorough refit, is to relieve the third-class cruiser "Hirondelle" at Tunis; the new torpedo-depôt ship "Foudre" at Bordeaux, commissioned on the 1st inst. with reduced crew, and is to proceed as soon as ready to Toulon, where she will undergo her trials; the "Chimère" is to commission for surveying duties round the coast; the despatch-vessel "Inconstant" returns home from China and is to pay off, while at Saigon the cuirassé de croisière "Triomphante" is to commission and take the place of the "Loire" as station-guard-ship; in Madagascar eight of the flotilla of light-draught gun-boats are to be paid off and placed in Reserve at Diego-Saurez. The Fisheries-protection Squadron, consisting of the third-class cruiser "Laclocheterie," aviso-transport "Manche," and despatch-vessel "Fulton," is to commission for this service towards the end of March; the "Laclocheterie" and "Fulton" proceeding to Newfoundland, and the "Manche" to Iceland.

The following additional regulations have been approved by the Minister of Marine for the new superior training school for the navy :—

The students for the school will be chosen each year from the lieutenants de vaisseau on the list for promotion; officers, however, who from their position on

the list have only a short time longer to serve in their present rank will be excluded, as well as those in command and those serving on distant foreign stations. The Director-General of the school will submit to the Minister the programme of the courses and lectures, which he proposes shall take place on board the different ships, and he will also fix the subjects in which the students will be examined, while undergoing instruction and when leaving the school.

Considerable discontent is felt in naval circles that the Government should be demanding a considerable sum of money for deepening the Charente at Rochefort, when no money is apparently to be spent on Corsica, which is considered by many officers to be the proper base of operations for the French fleet in the Western basin of the Mediterranean ; more especially is this considered to be the case, since the English Government have decided to spend large sums on the building of docks, etc., at Gibraltar. It is believed, however, to be the intention of the present Minister of Marine to create a secure harbour of refuge in Corsica, where ships will be able to coal and repair damages in safety.

It is contemplated to organise the ships of the reserve in groups of two, each group having one officer in command and one staff for two ships ; thus at Cherbourg there will be three such groups : the coast-defence battle-ships "Furieux" and "Requin," the coast-defence battle-ships "Tonnant" and "Vengeur," and the armoured gun-boats "Cocyte" and "Phlégéthon," etc. Similar arrangements will be made at the other ports.—*Le Yacht, Le Moniteur de la Flotte*, and *Le Temps*.

ITALY.—The following are the principal appointments which have been made : Vice-Admirals—E. Accinni to command of Third Maritime Department (Venice) ; Canevaro to command of Active Squadron, vice Accinni. Rear-Admiral—C. Turi to command of Naval Division in Red Sea. Captains—A. Persico to "Stromboli" ; F. Bajo to "Vittor Emanuele" ; R. Cali to "Aretusa" ; P. Fornari to "Maria Pia" ; F. Pongiglione to "San Martino" ; E. Gugliardi to "Sardegna."—*Bollettino Ufficiale*.

Rear-Admiral Turi, appointed to the command of the newly-constituted Red Sea Squadron, hoists his flag on board the ram-cruiser "Etna," a vessel of 3,500 tons, 7,500-I.H.P., with a speed of 17·5 knots. The other ships forming the squadron are the ram-cruiser "Dogali," 2,080 tons, 7,500 I.H.P., with a speed of 19 knots ; the ram-cruiser "Etruria," 2,500 tons, 7,500-I.H.P., with a speed of 19·5 knots ; the torpedo-cruiser "Caprera," 856 tons, 4,000-I.H.P., and a speed of 19 knots ; the first-class gun-boats "Scilla" and "Curtatone," 1,056 tons, 1,043-H.P., and a speed of 12 knots ; and the cable-ship "Città de Milano," 1,800 tons, and 900-I.H.P.

The "Etna" has an armament of two 25-centimetre (9·2-inch) guns, six 15-centimetre (6-inch) guns, eight 57-millimetre Q.F. guns, eight machine-guns, and three torpedo-tubes, with a crew of seventeen officers and 298 men ; the "Etruria" carries four 15-centimetre (6-inch) and six 12-centimetre (4·7-inch) Q.F. guns, eight 57-millimetre Q.F. guns, eight machine-guns, and three torpedo-tubes, with a crew of twelve officers and 245 men ; the armament of the "Dogali" consists of six 15-centimetre guns, nine 57-millimetre Q.F. guns, six machine-guns, and four torpedo-tubes, with a crew of twelve officers and 245 men ; the "Curtatone" carries four 4·7-inch Q.F. guns and six machine-guns, with a crew of nine officers and 122 men ; the "Scilla" also carries four 4·7-inch Q.F. guns, two machine-guns, with a crew of nine officers and 122 men ; the "Città di Milano" has a crew of six officers and sixty-eight men ; making a grand total for the squadron of seventy-three officers and 1,138 men.

Some important experiments have lately been made at Spezzia on board torpedo-boat "No. 75" with an artificial fuel, which has given very favourable results, combining with a heating-power equal to that of Cardiff coal the great

advantage of throwing out no smoke. In view of the supreme importance of obtaining a good smokeless fuel, further experiments have been ordered to be carried out.

Mention has already been made of the successful preliminary steam trials of the new first-class battle-ship "Sicilia"; the official trial has been equally satisfactory. On 19th September she made a six hours' run under natural draught. The maximum speed attained was 19·6 knots, the lowest during trial 18·2 knots, while the mean for the whole run was 19·2 knots, the engines developing a maximum of 16,900-I.H.P. This is a truly remarkable performance, and the firm of G. Ansaldo, at Sampierdarena, who made the engines, are justly proud of their work. A sister-ship, the "Re Umberto," whose engines were made in England, only attained a speed of 19 knots when under forced draught, the engines developing 17,250-I.H.P., and making 91 revolutions; the same speed being attained by the "Sicilia" with the engines making only 85 revolutions, and a mean I.H.P. of 15,000. In both trials the weather was fine and the sea smooth.

In the re-organisation of the Naval Academy at Leghorn, which was carried into effect last year, it was determined that the work of the Institution should be:— 1. The education of cadets, engineer students, and students for the accountant department of the navy. 2. To give the engineer students such technical instruction as may fit them to perform the duties of engineers of the second class. 3. To thoroughly educate the students in hydrography, gunnery, and torpedo work. 4. To complete the course of instruction for a certain number of petty officer artificers.

The students will receive instruction in the normal courses (*corsi normali*), which are divided into three sections: — Naval, Marine-Engineering, and Accountant. The time occupied for each section is, respectively, thirty-six, thirty-two, and twenty months.

Admission is by competition. The candidates must fulfil the following conditions:—

1. Italian Nationality.
2. To be not more than nineteen years old, and to be fit for service.
3. To have the consent of their parents.
4. To submit to the entrance examination.

Young gentlemen who have been dismissed from one of the State schools for bad conduct or insufficient progress cannot compete. Candidates who present a certificate from a Lycée or physical-mathematical section of a technical institute will only be examined in French, Italian, Arithmetic, Algebra, and Geometry. Candidates who cannot present the above certificate will further be examined in Italian Literature, Logic, Physical and Political Geography, General and Natural History. The charge for pension, etc., is 800 lire a year, and 800 lire for outfit, 500 of which to be paid on entry, and the balance at the beginning of the second year. Candidates or students may receive an allowance, when there are funds available, as follows:—*a.* Orphans of officers, excluding those whose fathers may have retired voluntarily, or in consequence of trial by court-martial; *b.* the sons of citizens decorated with the Military or Civil Order of Savoy, or the gold and silver medals of merit; *c.* pupils classed among the first five of their form and who have obtained four-fifths of the maximum number of points in their examination.

Candidates *a* and *b* enjoy their allowance during the whole time of their stay at the college. Students under *c* only enjoy it for the year in which they have won it. Students whose fathers may have died on service either in peace or war, or from wounds received in the service, are entitled to have all their expenses at the college paid by the State. Students lose their allowances if they are put back for a year on account of insufficient progress.

The choice of section is left to the students, subject to the consent of their parents to be given in writing. The authorities of the college have the right of

passing into the engineer section cadets who do not show any preference for the naval section, or into the accountant section students from either of the first two sections. Students who do not accept the change will be dismissed.

The normal period of instruction in the courses of study on shore last from the 15th November to the 15th June, and afloat from the 1st July to 1st November. Before passing from one course to a higher, the students must pass an examination on the subjects they have been studying.

The nomination of cadets, engineer students, and students for the accountant service takes place after their final examination on leaving the Academy. They have to serve a period of probation afloat, twelve months for cadets, eight months for the engineers, and four months for the accountant officers; at the expiration of this term, the cadets pass another examination, and if successful are appointed sub-lieutenants (*sottotenenti di vascello*). The engineer students are sent before their final course for a term to one of the dockyards, and after passing their final examination are nominated engineers of the second class.—*Rivista Marittima, Italia Marinara*, and *Mittheilungen aus dem Gebiete des Seewesens.*

UNITED STATES.—The following is a *précis* of the report of the Chief of the Naval Bureau of Ordnance:—

"$6,457,984 is the amount demanded for the year ending June 30th, 1897.

Of the 539 guns of all calibres from 4-inch to 13-inch thus far ordered, 379 have been completed and 308 are already afloat. No change has been made in the general system of gun construction. The wire-wound system seems to have grown somewhat in favour abroad during the last year, and the English have put into service a 12-inch wire-wound gun which is said to be of higher power and yet lighter than the previous model. The bureau is of opinion that the advantages claimed are not sufficient to warrant the substitution of the wire-wound or any other system of gun construction at present known for that now in use.

The wisdom of adopting the 13-inch gun has been proved by its piercing one of the side armour plates of the "Iowa," which was more than a match for the 12-inch gun. An improved gas check has been added to the 13-inch and 12-inch guns and the latest 8-inch gun. All 10-inch guns authorised have been completed. The 8-inch guns for the "Iowa" and "Brooklyn" have been delayed by failure of contractors to furnish suitable forgings. Those for the other vessels building are completed. The experimental nickel steel 8-inch is unfinished. The Hurst system has been tried and proved worthless from a practical point of view.

The bureau is satisfied that it can obtain higher velocities with equal projectile weights in a single-charge gun of one-half the weight of the Hurst gun, at the same time dispensing with the complicated and impracticable paraphernalia of the re-enforce cartridge.

All 6-inch guns of ordinary type have been completed. The Fletcher breech mechanism has been adopted for the 6-inch Q.F. guns, after test at the Naval Proving Ground, and six of these guns are well advanced in construction. It is proposed to convert the ordinary type 6-inch guns into Q.F. guns as rapidly as circumstances permit, beginning with the twenty Mark II. guns now on board the "Chicago," "Boston," and "Atlanta." Work has already been begun on the eight 6-inch guns of the "Chicago."

All 5-inch guns previously ordered being practically finished, twenty more sets of forgings have been ordered, and these guns will be fitted with the Fletcher breech mechanism.

No 4-inch Q.F. guns have been made during the year, owing to difficulty in obtaining completely satisfactory forgings. Ten new sets of forgings for this calibre have been ordered, and these guns will be fitted with the Fletcher breech mechanism. The difference between the Dashiell and Fletcher breech mechanisms is not so great as to require men to have experience in handling each in order to

work it efficiently, both systems using the slotted-screw breech plug. The Fletcher system seems to have the advantage in a less number of parts and greater power of extraction, but, on the other hand, the Dashiell system has had considerable test in service, and appears to be very efficient. While adopting the Fletcher system for the 6-inch calibre on account of its greater power of extraction, the bureau has decided to give the test of service use to this system in a small number of 4-inch and 5-inch guns before deciding which mechanism shall be adopted for future guns of each calibre.

The 3-inch field-gun with Fletcher breech mechanism has been further tested and improved during the year, and the bureau has decided to adopt this gun for landing and boat service.

Four hundred and thirty-one Hotchkiss and 165 Driggs guns for the secondary batteries have been ordered and completed. The recommendation that a reserve of 10 per cent. of guns in excess of those actually needed is renewed.

No satisfactory powder for the 13-inch guns has yet been obtained. The bureau has reduced its requirements for this and the 12-inch powder to 2,000 f.s. muzzle velocity and 15 tons pressure. The difficulty of obtaining a satisfactory brown powder for the larger calibres, as well as the many inconveniences attendant upon the use of brown powder, emphasise the importance of developing a smokeless powder for all calibres. Five hundred rounds of 6-pounder ammunition loaded with smokeless powder has been put on board the ships of the North Atlantic Squadron for use in target practice. The problem of securing uniform ballistic results has been solved, but time is required to determine the question of stability. Nitro-glycerine powders have proved unreliable, and the bureau considers that the results which it has obtained from its own pure gun-cotton powder in the small arm are as good as can be reasonably expected, and it proposes to adopt this powder for service use, with the requirement of 2,450 f.s. velocity and not over 45,000 lbs. per square inch pressure. Both powder companies stand ready to undertake the manufacture of smokeless powder upon the bureau's plans, and it is expected to place orders for this powder with them in the near future.

With the type hydraulic gun-carriages on the "Monterey" the 10-inch guns were fired at the rate of $2\frac{3}{4}$ minutes and the 12-inch guns at the rate of about 4 minutes per round. This speed was the average of four shots from each gun, subject to the usual delays of waiting for orders to fire, etc., the ship being in a seaway and the shots all carefully aimed. The telescopic sights have worked so satisfactorily that they will be fitted to all the Q.F. guns in addition to the usual bar sight."

The Naval Bureau of Ordnance has received a report from the Indian Head Proving Ground giving the results of experiments with semi-armour piercing shell fired against Harveyized plate. These were the first experiments of shell of this character against any but oil-tempered plates. The shell were 4 and 5 inches in calibre, and the plate was 3 inches in thickness, and was the ballistic plate which represented the group of armour for the side of the cruiser "Brooklyn." In the first round, a 4-inch shell was fired with a velocity of 1,700 f.s. It broke up on the face of the plate, three pieces of the face, together with the base plug, falling on the ground in front of the plate. The diameter of the hole in the face of the plate was 8·5 inches. In the second round the 4-inch shell was given a velocity of 1,815 feet per second. The base of the projectile was broken in three pieces, which, with the base plug, were found on the ground in front of the plate. The remainder of the projectile, with the back bulge of the plate caused by the impact, was driven into the backing. Diameter of hole in the plate, $7\frac{1}{8}$ inches. No portion of the projectile got through the backing. Two attempts were made to burst 4-inch shell charged with ·75 lb. of powder in an explosive chamber, but neither was successful. A 5-inch shell was fired against the "Brooklyn" plate with a velocity

of 1,694 feet per second. The projectile broke up. Some portions of the projectile got into the backing. The diameter of the hole in the face of the plate was 7⅛ inches. The plate was cracked for 6 inches from the impact. A 5-inch shell loaded with 2·25 lbs. of powder was exploded in the explosive chamber and broke into thirty-six fragments.

The Navy Department has received reports from Ensign Williams and Lieutenant N. E. Mason of a test of a Carnegie thin shield plate ⅝ of an inch in thickness and face hardened. The width of the plate was 34 inches and its length 48 inches. The plate was fired at fourteen times with 1-pounder projectiles. Lieutenant Mason sums up the results: "This plate, when inclined at an angle of 40° will keep out 1-pounder piercing projectiles fired with a muzzle velocity of 1,750 feet per second, at ranges greater than 105 yards when the impacts are above the supports, and at ranges greater than 240 yards when the impacts are between or near the supports. When the line of fire is normal to the surface of the plate, it will keep out the same projectile at ranges greater than 1,975 yards." Ordnance experts regard the results obtained from the plate as excellent. They are waiting for the test of the Bethlehem thin steel plate, which will be made shortly. When this test is completed, Captain Sampson, chief of the Bureau of Ordnance, will adopt the plate giving the best results as the type to be used in the naval service.—*Army and Navy Journal.*

MILITARY.

HOME.—The following are the principal appointments which have been made: Staff.—Major-General Sir W. Butler, K.C.B., to command the South-Eastern District, vice Major-General Lord W. F. Seymour; Colonel L. V. Swaine, C.B., C.M.G., to be Major-General, and to command the 2nd Infantry Brigade, Aldershot District, vice Major-General Sir W. Butler; Major-General C. F. Clery, C.B., to be Deputy Adjutant-General to the Forces; Colonel T. Kelly-Kenny, C.B., to be Major-General, and to command the Third Infantry Brigade, Aldershot District; Colonel (temporary Major-General as Commissary General-in-Chief in India) A. R. Badcock, C.B., C.S.I., I.S.C., to be Quartermaster-General in India; and to have the temporary rank of Major-General whilst so employed and the substantive rank of Colonel in the Army, vice Colonel and local Major-General E. Stedman, C.B., I.S.C., appointed a Major-General on the Staff to command a First Class District in India; Colonel E. R. Elles, C.B., Deputy Quartermaster-General in India, to command a Second Class District in India, and to have the temporary rank of Brigadier-General whilst so employed, vice Colonel A. A. A. Kinloch, C.B., whose period of service in that appointment has expired; Colonel I. S. M. Hamilton, C.B., D.S.O., Military Secretary to Lieut.-General (local General) Sir G. S. White, G.C.I.E., K.C.B., Commander-in-Chief, East Indies, to be Deputy Quartermaster-General in India, vice Colonel E. R. Elles, C.B.; Colonel G. Simpson, I.S.C., an Assistant-Quartermaster-General in India, to be a Deputy Adjutant-General in India, and to have the temporary rank of Brigadier-General whilst so employed, vice Colonel E. W. Begbie, D.S.O., Indian Army, who has vacated that appointment; Colonel J. T. Cummins, D.S.O., I.S.C., an Assistant-Adjutant-General in India, to be an Assistant-Quartermaster-General in India, vice Colonel G. Simpson, I.S.C.; Colonel J. T. Cummins, D.S.O., I.S.C., an Assistant-Quartermaster-General in India, to command a Second Class District in India, and to have the temporary rank of Brigadier-General whilst so employed, vice Major-General A. F. Hamilton, R.E., whose period of service in that appointment has expired; Brevet Colonel W. G. Thomas (since deceased) from Lieut.-Colonel, half-pay, to be an Assistant-Adjutant-General in India, and to have the substantive rank of Colonel in the Army, vice Colonel J. T. Cummins, D.S.O., I.S.C.; Brevet Lieut.-Colonel J. M. Grierson, R.A., to be Military Attaché at Berlin.

Strength of the Army.—Recent returns of the strength of the British Army at home and abroad, exclusive of the Indian Native Army and the forces raised by Colonial authorities, show that there are in round numbers 221,000 officers and men actually serving, and entirely exclusive of the Reserve. This total allows about 1,300 to the three regiments of Household Cavalry; 18,500 to the twenty-eight regiments of Dragoon Guards, Dragoons, Hussars, and Lancers; more than 37,000 to twenty-one Horse Batteries, eighty-seven Field Batteries, ten Mountain Batteries, ninety-three garrison companies, and the depôts and riding establishments of Artillery; 7,700 to the various companies of Engineers; 6,000 to the seven battalions of Foot Guards; 137,500 to 141 battalions of Line Infantry, Highlanders, and Rifles; 5,000 to various Colonial corps raised as part of the Imperial forces; 3,500 to the Army Service Corps; 2,500 to the Medical Staff Corps; and the remainder to the Ordnance Store and Army Pay Corps. In the distribution of the army there are on home service about 107,000 men, of whom 27,000 are in Ireland, nearly 4,000 in Scotland, and the rest in England, Wales, and the Channel Islands; 76,000 in India, Burmah, and Aden; nearly 15,000 in the garrisons of Malta and Gibraltar; 3,500 at the Cape and Natal; 3,000 at Hong-Kong; 4,500 in Egypt; and the residue are scattered over the West Indies, Bermuda, Nova Scotia, Mauritius, Ceylon, the Straits' Settlements, and other places, some of which, like St. Helena, have the service of but very small bodies of the Imperial troops. The Canadian Dominion has only about 1,400 of the Queen's forces. Australia has none at all, and the recent despatch of men to the African West Coast has only added about 1,000 soldiers to the ordinary strength in that part of the Empire. India remains the great absorbent of the Regular forces abroad, and at the beginning of this month there were in the four great commands of the Punjab, Bengal, Madras, and Bombay, nine regiments of cavalry, eighty-eight batteries and companies of artillery, and fifty-three battalions of infantry. The Bengal command still takes up the largest portion of the British troops in India, having some 24,000, and the new command of the Punjab comes next with 20,000; and of the two other commands Bombay has about 1,000 more men than Madras, the latter including Burmah.

Re-organisation of the Cavalry.—A scheme is now being considered by the Secretary of State for War, of which the following are the main outlines:—Three brigades of three regiments each will be stationed at Aldershot, Canterbury, and Colchester. Each of these will be on a higher establishment than the remaining cavalry regiments, which will act as feeders to the nine forming the three brigades, and also to the regiments in India. The Canterbury depôt, as a depôt, will no longer exist. On active service, the nine regiments will consist of three squadrons each, the fourth remaining behind to act as depôt squadron and feeder to the others. The regiments elected to do duty in Ireland will be those on the lower establishment. Each of the household regiments will be reduced by one squadron, with a view to reduction of expense. The regiments forming the Canterbury and Colchester brigades will not of necessity be stationed at those places, but the towns from which the brigades take their titles will be regarded as their centres.

Army Rifle Association.—The annual meeting was held at the R.U.S. Institution on the 11th ultimo, Colonel G. Paton, Commandant School of Musketry, Hythe, in the chair. The hon. secretary stated that the receipts for 1895, including a balance from 1894 of £200, had been £1,026, and that there was a balance in hand of £312. The chairman stated that the association was in a prosperous condition, and interest in its proceedings was manifested all over the world, although he regretted that some regiments still remained indifferent to the question of rifle shooting. The actual money received by entries was £594,

as against £591. The Queen and the Duke of Connaught had given handsome cups to be shot for, and it was proposed to ask the sanction of Her Majesty to provide a replica of her cup to be shot for by cavalry. It was, he thought, incumbent on the different regiments to show that the interest taken in them by the members of the Royal family was not misplaced. He announced with satisfaction that the Army team won the Whitehead Cup revolver match at Bisley, and tied with the Royal Marines for first place in the United Service Cup, also at Bisley. The cavalry sometimes felt that, using the carbine, they were competing against the infantry, using the rifle, for the Queen's Cup at a great disadvantage, and this was why it had been resolved to have separate prize lists for cavalry and infantry. At the urgent request of the cavalry officers on the committee, another match had been arranged for cavalry instead of the inter-squadron volley match. He hoped the alterations would meet with the approval of the cavalry branch of the Service. In conclusion, he added that it was proposed to ask commanding officers whether their regiments would be willing to subscribe to the expense of building a mess-hut at Bisley.

Manual Exercises for Infantry.—With a view to the assimilation of the exercise for all regiments of infantry, the following order is issued for the information of all concerned:—

> In Section I. of Rifle Exercises (Lee-Metford Rifle), 1892, the exercises therein prescribed for "infantry, except rifle battalions," are cancelled.—Army Order, 21st January, 1896.

Officers' Swords—New Pattern.—Description of the sword: Hilt, steel, half-basket, pierced with scroll design and Royal Cypher and Crown chased. Black fish-skin grip, bound with three strands of silver wire, back chequered to pommel with flat part near guard for the thumb, straight blade, grooved and spear-pointed.

Measurements:—

Blade, full size—32½ inches long and 1 inch wide at the shoulder.
Hilt—total length, 5¾ to 5⅞ inches.
Grip—total length, 5 inches.
Weight—from 1 lb. 11 oz. to 1 lb. 12 oz., without scabbard.

FRANCE.—The average age of the Generals of Brigade promoted to Divisional commands in December last was 58·5 years, the eldest officer being in his seventieth year. The Colonels promoted to Brigades averaged fifty-seven. Amongst the junior ranks it is noticeable that there are captains still serving (the exact number is not given) who were non-commissioned officers in the Army of the Rhine in 1870.—*L'Avenir Militaire.*

GERMANY.—*Suicide in the German Army.*—The *Militair-Wochenblatt*, No. 9 of this year, contains a very interesting analysis of the figures relating to suicide in the German Armies. During the decennium 1880-90, the rate has sunk from 7·65 per 10,000 to 5·47, and since 1895 to 4·22 in the Prussian Army. During the first period the average for the whole army was 6·33, as against 6·07 in the Prussian troops only, and 8·11 in the Saxon corps, and 8·05 in the Würtembergers. The whole figures for the army, exclusive of the Prussian corps, are not yet available for the last five years.

As compared with the civil population, taking the men of the same age, the rate, though materially above the average of both town and country together, is practically identical with the rate in towns alone. Out of the whole number of cases reported, only 2·5 per cent. are attributable to ill-treatment; but, quoting from an earlier report, a very considerable number are due to a keener sense of honour in the soldier than exists amongst civilians.

These figures should effectually dispose of the ignorant outcry so often raised against the brutality of *Prussian* discipline. The Austrian Army is certainly not conspicuous for over severe discipline, indeed the scale of punishment and limitations to the power of the non-commissioned officer are lower than in either the French or German, yet the Austrian figures for the ten years 1880-90 are 12·53 per 10,000, against 6·07 in the Prussian Army, 3·3 in the French, and 2·09 in the British.

Notes on Military Equipment in Central Africa.—No. 6 of the *Militair-Wochenblatt* publishes a short summary from the report of Lieutenant Graf von Götzen, 2nd Guard Uhlans, on articles of military equipment issued to him for service in Central Africa. From this it appears that the short-sword bayonets, 13½ inches, proved excellently adapted for jungle work in the hands of the natives. The spades of the regulation pattern also did well. There was no opportunity of testing the Mauser carbines (M 88) on the enemy, but against game he notes that on one occasion he put two bullets (hard metal casing) through a small gazelle at about 25 yards. The animal stood perfectly still, and only when a native went towards it, did it spring forward and fall dead. One bullet had pierced the lungs, the other just grazed the spine. He also adds that the oxen were frequently shot with the rifle, and after receiving a mortal wound would go on quietly grazing for 5 to 10 minutes before they collapsed.

A small folding boat, something like the Berthon pattern, answered very well.

A new Target for Artillery Aiming Drill.—The "Deutsche Metallpatronenfabrik" in Karlsruhe has just brought out a practical and portable arrangement for indicating to a range-finding party the position of its supposed enemy by puffs of dust, resembling the vapour and dust thrown up by a gun fired with smokeless powder. Essentially it consists of a kind of air pump, filled and worked like a garden hose ; the difficulty was to find a sufficiently finely divided substance to puff out like smoke at each stroke of the pump. This appears to have been satisfactorily overcome. In combination with a heliograph to indicate the flash, the idea should prove exceedingly useful in range-finding and judging distance practices ; also at field days to enable umpires to decide which guns are in action and at what.

THE INVASION OF ENGLAND.

It is always of interest and service to see ourselves as others see us, and just now it may be useful to take into account military opinion in Germany on our position.

In the *Militair-Wochenblatt* of the 15th and 18th of January, Baron von Lüttwitz, an officer of the German Staff, examines the question of the possibility of an invasion of England by the light of the experiences of history, prefacing his essay with the remark that, though Great Britain still holds by far the greatest number of colonial possessions, yet, in various quarters of the globe, the interests of other nations are beginning to assert themselves. He thinks there will be a great struggle for supremacy in Asia at no distant day, but that the decisive battle for this must be fought out in Europe, and he expresses surprise that, while all the other great Powers of Europe have perfected their organisation, and stand armed to the teeth and equipped for war as never before, England alone should abstain from this necessity of the times. In politics, after all, might is right, and he who has great possessions must be strong enough to defend them. He scoffs at our system of recruiting, saying it remains where it was in the time of Wellington and the American War of Independence, with its soldiers of the Line, Militia, and Volunteers all voluntarily enlisted. Such a system is only sufficient for wars with uncivilised nations. Great Britain will not interfere directly in a Continental

war, while from invasion she thinks herself safe. She rests her belief in this on the bare fact that since the Conquest no invasion has succeeded, and that her naval supremacy frees her from the necessity of having her land forces in a state of more complete preparation.

Since Elizabeth's time England has, on the whole, enjoyed this naval supremacy, but in 1667 she was reduced to a second-rate sea Power, and the Dutch under de Ruyter boldly sailed up the Thames and burnt English vessels after defeating her fleet.

In 1797, England could only place thirty-six vessels in line to oppose the French and Spaniards. Even if England is now superior to any one naval Power, she would not, he thinks, be superior to the combined fleets of France and Russia. But the chief factor in any future war is what nation has the greatest sea power on the decisive field of battle — the English Channel. The French Channel fleet is even now on a par with that of England. If the Russian fleet joined it, and possibly a portion of the German fleet (and the facilities for the combination of these offered by the Emperor-William Canal must be taken into consideration), the preponderance of England in the Channel would be very problematical. Judging by the recent exertions, England has probably foreseen this herself. If we examine, he says, the much-vaunted British Constitution, here again history declares many chinks in her armour. Since Cromwell's time Ireland groans in her fetters. Every military disaster that England has suffered has evoked rebellion in Ireland. Every invader has found, and will find, an ally in her. It took 30,000 men and immense exertions to put down the rebellion of 1798. For all this, the Briton boasts, and that with right, that never yet has an invader of his island succeeded.

Now, this is a remarkable fact, the writer continues, considering we have in all periods of history beheld British Armies fighting on the Continent. They took part in nearly all the battles fought against Louis XIV., against Frederick, and against Napoleon.

Is, then, an invasion of Great Britain, from a military point of view, something totally different and much more difficult than a British invasion of the Continent of Europe? Must all attempts at an invasion of England fail, because there is something impossible in the undertaking? asks the writer, who then proceeds to make what he calls a critical examination of the various attempts that have taken place.

He attributes the failure of the Spanish Armada in 1588 to defects in plan and defects in organisation, and considers:—

1. A mistake was made in mixing the invading army with the sea-fighting fleet. The latter should have been kept quite separate from, and unencumbered by, the invading troops, so as to be free to act against the English fleet. The former should have been embarked in transports protected by fighting vessels, which the Spaniards with their numerous fleet could well have spared.
2. Ignorance on the part of the Spaniards of the English Channel; five-sixths of their vessels had so heavy a draught that landing troops from them was only possible in well-defended harbours.
3. Ignorance of the sudden changes of weather to which then, as now, the Channel was liable. The close order observed by the fleet was, therefore, in the absence of trustworthy pilots, doubly dangerous.
4. Small scouting vessels of light draught seem to have been entirely wanting.
5. That the leader was quite unacquainted with naval matters.
6. That a landing was to be attempted before the English fleet was defeated.

In 1690, Louis XIV. sent James II. with 10,000 men to invade Ireland, but he was defeated at the Boyne on the 13th July by William III., and in 1691 the remnant of the invading army surrendered. Louis made the mistake of

aiming the blow at one of the limbs instead of at England, the vital centre. On the 18th July, 1690, de Tourville defeated the combined Anglo-Dutch fleet, so that the waters of the English Channel may have been described as French waters. The friends of James II. besought Louis XIV. to seize the opportunity; but he would not, though everything was in favour of the invaders, as the French were supreme at sea, and William III. was engaged in suppressing rebellion.

The projected invasion of the old Pretender in 1708 was undertaken with too small a force, and at the wrong point. No landing was attempted, the appearance of Admiral Byng with the English fleet having sufficed to send the French squadron of 32 vessels back to France.

Next comes the plan of invasion projected by Napoleon in 1805, which will assuredly form the ground work of any future plan for the invasion of England. England's strength lay on the sea in her fleet, France's on land in her army. How was the struggle to be carried on? Obviously a naval war must be changed into operations by land, if France was to use her strength to the best advantage.

There were two ways of carrying into practice this theory—the indirect and the direct; the first led to military occupation of the countries of England's allies; the latter to the invasion of her colonies, of Ireland, or of England—London being the objective in the latter case.

The first plan had been steadily followed by Napoleon, 1800 to 1812, by the occupation of Vienna, Berlin, Madrid, Moscow; and what did it lead to? St. Helena!

In like manner, an invasion of Ireland would be but to grapple with a side issue, avoiding the main point, and so fail of permanent effect. Certainly, had he decided to act simply on the defensive against England, he could have operated effectively in Ireland on the offensive. 30,000 or 40,000 men under a general of the calibre of Masséna, thrown into Ireland, would soon have put an end to English subsidies to the allies.

The Directory had held this view, and on 15th December, 1796, had embarked at Brest General Hoche, fresh from the pacification of La Vendée, on seventeen ships of the line and thirteen frigates, a force destined for the occupation of Ireland. At the landing in Bantry Bay a storm threw the French ships in confusion, carrying the flag-ship, with Hoche on board, back to La Rochelle. Thereon the expedition was regarded as a failure. The attempt was to be renewed in the autumn of 1797. But the Dutch fleet, which was to have transported the invading army, was so badly beaten by Admiral Duncan at Camperdown that it quickly sought a refuge on its own shores.

It is possible that these failures set Napoleon against any attempts to invade Ireland. He saw that the only infallible way to destroy England's power was by the invasion of England. England had been isolated by the Treaty of Lunéville, The First Consul at once ordered the assembly of 100,000 men, and the construction of a flotilla of small vessels of light draught at Boulogne. Then came the Peace of Amiens. On the 13th May, 1803, however, the war broke out afresh. Public opinion, more than his own inclination for the task, now drove Napoleon to take decided measures towards the invasion of England, which had become a rooted idea in France. His preparations were postponed till, in 1805, they were near realisation. They were two-fold in character—military and political. The first to secure success, and the second to secure abstention from foreign interference.

Now, what did Napoleon in 1805? What do we, at the present time, understand by the success of an invasion of England? A lasting conquest like that of William of Normandy? Certainly not!

Success would consist in :—

1. The transport and landing of an invading army.
2. The destruction of the British forces.
3. The occupation of the capital as centre of the material as well as the intellectual wealth of the country.

4. A quickly-concluded peace, under such conditions as would make it impossible for England to resume the war for a long time.

There was but one way for England to render this success impossible—by annihilating the invading army during the passage or in the attempted landing of the force. The first steps taken must be to blockade the French and Dutch harbours, to render impossible the preparations for the passage of the Channel, or at least to hinder them as much as possible.

How well the English admirals of 1588 had understood this!

In 1805, they failed in doing so owing to the excellent arrangements made by Napoleon for the protection of the harbours—over 600 heavy guns had been mounted on shore batteries along the French coast. The organisation of the fleet of transports progressed unremittingly.

The leading principle was kept in view of having the fleet kept for fighting and the invading force to have its own transport.

1,240 gun-sloops, gun-boats, etc., and 625 transports to follow his second line, were ready in Vimereux, Ambleteuse, Boulogne, and Étables.

By means of these, 100,000 men could be thrown on the coast of England at one crossing.

The troop-boats were specially designed for their transport being capable of being rowed or sailed, while they only drew 6 or 7 feet of water, and were keelless, to enable a landing to be effected even at ebb tide.

Each gun-sloop carried one company and four heavy ship's guns; the gun-boats, one company, one ship's gun, and one field gun, for which two horses were carried amidships.

It was reckoned by the most eminent seamen in France that 48 hours would have sufficed with such preparations to embark and pass over 132,000 men and 400 guns, and that the train with 1,000 horses could follow within a week, during which time it would, of course, be necessary for Napoleon to remain master of the Channel. But since the Battle of the Nile, the French fleet had been in every way inferior to the British. Only by sacrificing a portion for the benefit of the whole, therefore, could success be hoped for. The author then contrasts the two fleets of the present day with those of 1804. In the mouth of the Thames there were then twelve ships of the line to watch the Dutch fleet in Texel, seven or eight ships of the line at Spithead, with a number of frigates, brigs, and gun-boats, some not equipped. Both squadrons were inferior to the Dutch fleet. Lord Cornwallis blockaded Brest with nineteen ships of the line, twenty-one French ships of the line were lying there under Vice-Admiral Ganteaume. If the British squadron had timely notice of the passage it could return within four to six days to Dover, followed, of course, by the French, who would attack them. The rest of the British fleet was in pursuit of the French Admiral Villeneuve, who had left the West Indies with twenty-one ships of the line bound for Ferrol. He had orders to raise the blockade of Ferrol or Brest, uniting with the French squadrons, then to return to cover the passage of the army invading England.

"This is an unaccountable order," says the writer; "the very contrary should have been done." He would, had he obeyed it, have been followed by the British fleet. Now, this should, by every means, have been lured away from the Channel, and the Channel Fleet attacked by the French Home Fleets.

However, Napoleon was, he says, by this time no longer in keen earnest about the invasion. The fact remains that the largest portion of the English fleet was 187 miles west of Ferrol, and that Nelson was off Gibraltar; therefore, these squadrons could not have returned to the Channel in less than a fortnight; while the French Channel Fleet could have engaged and held in check that of the British there, so that in the middle of July the invasion was possible. The British Militia and Volunteers of that day, with their antiquated organisation, could hardly have resisted Napoleon's great military genius and his experienced soldiers imbued with the spirit of self-confidence and led by young but practised generals eager for glory.

The way in which the English scattered their troops all along the coast, against all the rules of war, says little for their capacity. States which, like England, depend on Volunteer forces, will have a rude awakening when opposed to Regular troops.

The French troops were distributed as follows :—

Vimereux (Lannes)	...	14,000 men
Ambleteuse (Davout)	...	26,000 ,,
Boulogne (Soult and the Emperor)	...	40,000 ,,
Étables (Ney)	...	22,000 ,,
Texel (Marmont)	...	25,000 ,,
In reserve	...	27,000 ,,
Total	...	154,000 men

These once landed could be brought under one command in one day, and within four days be in London. This unprovided with defences would fall at once. The possession of the capital would not have meant the possession of the arsenals and dockyards, but a heavy fine would have been exacted from the wealthy inhabitants. No one knew this better than Napoleon. Had France then had peace on her own frontiers, there is little doubt of the success of the invasion of England. Revolution in Ireland would have co-operated with the invader, and Napoleon fully believed in the possibility of success, and only renounced the expedition because he foresaw greater certainty and more important results from a Continental war with Austria.

"An invasion of England would be risky—not impossible." Quoting from von Wartenburg, he adds that many events pronounced by contemporaries impossibilities have yet been carried out by commanding genius. If this study —says the author, in conclusion—should have succeeded in destroying the illusion of the unassailability of Great Britain, it will have fulfilled its object.

Since 1805, the introduction of steam and the electric telegraph have increased the favourable chances of an attack on England, the assembly and quick transport of an invading army being thereby much facilitated. In these days especially should this factor be borne in mind."

We will not venture to follow the writer in his curious readings of English History, nor do we quite see how the French Channel Fleet was to have attacked and held the English Channel Fleet, seeing it was blockaded by Lord Cornwallis so closely, says Captain Mahan, "that it excited not only the admiration but the wonder of contemporaries." And it is hardly to be supposed that our navy would be taken unawares now, as it was in Louis XIV.'s time, when it was "paralysed by the corruption which prevailed in the public service," as one historian puts it. But those who look upon an invasion as *impossible* should remember that, but for Nelson and the admirable handling of the British Navy, it would not have been so in 1805.

Since then, other navies have also made great progress ; and as the views of this German officer certainly prevail to a great extent on the Continent, it would be well to consider what might happen to England in the event of a coalition of two or three naval Powers against us, compelling us to unduly scatter our fleet. To avoid this, it is necessary, not only to maintain our naval supremacy all over the world, but to exert ourselves unremittingly to raise our home defence force to a high state of completeness and efficiency in men and material, so that in the event of our ships being lured away or overpowered, our field army, aided by a well-thought-out system of field defences, may on every possible line of advance of an invader hold its own.

SPAIN.—The following interesting details of the Revolutionary Army in Cuba, are from the pen of the special correspondent of the *Army and Navy Journal*, of New York.

Havana, Cuba, January 6th, 1896.

Various estimates, most of them purporting to be authentic, have been published in the United States with regard to the strength and character of the Cuban Revolutionary Army. Some of these estimates, emanating from Spanish sources, have been ridiculously small; while, on the other hand, the zealous agents of the revolution have given to the public figures that are greatly exaggerated.

The special representative of the *Army and Navy Journal,* desiring to give all the facts and form a nearly correct estimate, has gained access to the official Spanish data in Havana and has personally visited all the provinces of the island; seen and estimated for himself, and talked with the commanders, Spanish and Cuban, in the different districts.

Since the invasion of Matanzas, two weeks ago, the number of rebel troops has increased about 8,000. The total number of men under General Gomez do not exceed 35,000, and this will include several thousand (perhaps 3,000) who are engaged in the Post Office service of the army, men in charge of the inland stores and hospitals, and labourers and guards upon the rebel plantations on the plateaus of the Sierra Maestra mountains, located in the extreme eastern end of the island. It certainly is very near the truth to say that at present in the field engaged fighting Spain's Army of 110,000 men are 32,000 Cubans.

Now, in the provinces of Matanzas and Havana, under the immediate command of Gomez and Maceo, are about 17,500 men, of whom 12,000 are cavalry, with good horses but a great lack of saddles. The cavalrymen are armed with the machete, a weapon of different patterns and makes, but all of a length nearly equal to that of the American cavalry sabre. There are no rifles, but small carbines and revolvers are carried by the majority. Nine out of ten of the horsemen are white. The infantry of this division are mostly black, but they are hardy fellows and, remarkable as it may seem, they are able to keep up with the cavalry. At least they have done so during the past two weeks, when the army marched every day from early morning until late at night, and some days covered a distance of forty miles.

About 2,000 of the rebel infantry have the best Mauser rifles, most of them captured from the Spanish troops. The remaining 3,500 have a remarkable assortment of arms—Remington, Springfields, Marlins, shot-guns, old breech-loading muskets and various weapons dating from ancient days. Every infantry-man carries a machete.

Because of the great diversity of firearms and the numerous calibres, ammunition to suit is hard to obtain, and there have been but comparatively few deaths in the Spanish ranks caused by bullets. The machete has thus far done the principal work, and it is superior, as handled by the Cubans, to the bayonet of the Spaniard. Where the Spanish squares are deep the Cuban cavalry and infantry charge together, infantrymen running alongside the cavalry horses.

With this division of the rebel army are several small field pieces of an old make, but very little ammunition for their use. Before the battle at Colon your correspondent witnessed the making of "cannon-balls" of barbed wire taken from the fences of near-by plantations.

There are no tents, not even for Gomez and Maceo, and these officers, as well as many of the soldiers, sleep in hammocks swung from trees. The great majority of the army, however, are well supplied with rain coats, and in these they lie upon the ground. They are exposed to frequent rains, but apparently do not mind it, and not a soldier makes a change of position, even though it pours upon him while he sleeps. The men, as a rule are well clothed, taking into consideration the mild climate of Cuba, but a majority of the black troops and many of the white are barefooted. This is not a hindrance to their movements, however, as large numbers of them never wore a foot covering.

In the province of Santa Clara the insurgents number about 5,000, nearly equally divided between horse and foot, and in the province of Camaguey the

rebels number 3,000, all with horses. The first are commanded by General Charles Roloff and the Camagueyians by General José Rodriguez. These latter are splendid horsemen, equal to American cowboys, and constitute the flower of the Revolutionary Army. Their horses are good and they are fully equipped in the matter of saddles, machetes, revolvers, etc.

In the Santiago de Cuba province the rebels in the field number about 7,500 men, two-thirds of them black, under General José Maceo. They are poorly armed, have but a very small number of firearms, and little ammunition. This force is not at present actively engaged fighting the Spanish troops, but is rather a sort of force from which to recruit the other divisions of the Revolutionary Army.

Recent events have proved that the Cuban Generals employ tactics far superior to the Government's officers. Few of them are military graduates, but all have seen service in other wars.

Maximo Gomez, the General-in-Chief, is a graduate of Spain's West Point, Segovia Military School, and was for many years an officer in the Spanish Regular Army, serving in San Domingo and later in Cuba. When the Cuban revolution of 1868 broke out Gomez commanded a regiment at Bayamo. Because of difficulties with the Government he joined the insurgents, was made a Brigadier-General, and several years later succeeded the American General Jordan, as Commander-in-Chief. Upon the close of the war, in 1878, Gomez went to San Domingo, where he resided up to the breaking out of hostilities, February 22nd last.

UNITED STATES.—Experiments on an extensive scale were lately carried out in New York harbour with the new dynamite gun. The gun was loaded with a shell weighing 350 lbs., and containing a charge of 100 lbs. of nitro-gelatine. The discharge of the gun carried the projectile to a point three miles distant, where it struck a rock cliff and exploded, tearing a hole in the face of the solid rock 6 feet deep and 3 feet in diameter. A projectile containing a charge of 500 lbs. of nitro-gelatine was fired, so as to strike the surface of the water 2,100 yards from the gun; the result was equally satisfactory. The shell exploded on coming into contact with the water, sending a column of water high into the air. The explosion was felt a distance of thirty miles. The force projecting the shells is compressed air, which is obtained from a power-house situated at a point about a mile from the scene of the experiments and concealed below ground. The air is transmitted through pipes, and will carry a shell containing 100 lbs. of nitro-gelatine a distance of three miles; a very accurate aim can be obtained. Five shells fired recently in quick succession dropped on a sandbank inside a parallelogram 7 yards long by 5 feet broad. The gun was fired and loaded at intervals of only 10 seconds; the gun became colder instead of hotter by the rapidity of the fire, owing to the vacuum formed in the barrel. The gun need not be sighted, but in a measure finds it own range automatically—that is, the entire surface of New York bay is divided into imaginary squares, to each square a different elevation corresponds, which elevation can be given by touching an electrical button with a number corresponding to the square to be covered. The effect of the bursting of a shell alongside a ship is as disastrous as when it is imbedded in her hull. The Government is so well satisfied with the result of the experiments, that it has declared its intention of having these guns mounted at various points along the coast.

An ingenious method of determining the complete motion of a rifle during recoil has been successfully carried out by Dr. Albert Cushing Crehore and First Lieutenant George Owen Squier, 3rd Artillery, U.S A., by means of photography. A dark screen was attached to a rifle with five bright beads at fixed distances along the barrel. A photograph was taken during recoil; the rifle itself is concealed, but the paths of the bright beads are recorded on the plate in interesting and variable curves. From these the successive positions of the

axis of the rifle may be traced by taking a point on any one curve and measuring where the fixed distance between the luminous points would strike on the next curve. So again the movement or jump before the bullet left the muzzle was determined by so fixing a small screen and connections close to one luminous point that it eclipsed it at the instant the bullet left the muzzle, and thus divided the trace showing movement while the bullet was in the bore from that subsequently performed. The result showed that the jump of the Springfield rifle is approximately zero. The same method is proposed to be applied to heavy guns, luminous beads being replaced by incandescent lights and the camera removed far enough to be free from the blast of explosion, to which end the use of a mirror might be found valuable.—*Army and Navy Journal.*

FOREIGN PERIODICALS.

NAVAL.

AUSTRIA-HUNGARY.—*Mittheilungen aus dem Gebiete des Seewesens.* No. 1. Pola and Vienna: January, 1896.—"Theory of Naval Tactics." "The Solomon Islands" (with some good photographic views). "Types of German War-ships" (with photographs). "The English Torpedo-boat Destroyers." "The Grounding of a French Naval Division." "Foreign Naval Notes." "Notices of Books." No. 2. February.—"Theory of Naval Tactics" (*concluded*). "Types of United States Cruisers" (with photographs). "Petersen's and Macdonald's Water-tube Boilers." "Wave-Measurement in the Atlantic." "Steam-steering Engines." "Improvements in Water-tube Boilers." "The Temperley Coaling Apparatus." "The French Submarine-boat 'Goubet II.'" "Foreign Naval Notes." "Book Notices."

FRANCE.—*Revue Maritime et Coloniale.* Paris: January, 1896. Has not been received up to time of going to press.

Le Yacht. Paris: 4th January, 1896.—"The War Navies in 1895." "Yachting Notes." "The Projected Tax on Yachts." "The German battle-ship 'Brandenburg'" (with fine instantaneous photograph of ship steaming full speed). "Naval Notes, Home and Foreign." 11th January.—"The Higher School of War for the Navy." "The War Navies in 1895" (*concluded*). "English Shipbuilding in 1895." "Yachting Notes." "The Russian Torpedo-boat Destroyer 'Sokol'" (with photograph). "Naval Notes, Home and Foreign." 18th January.—"The Proposed Tax on Yachts." "Yachting Notes." "The New Constructions at end of 1895." "The French battle-ship 'Marceau'" (with photograph). "The new American battle-ships 'Kearsage' and 'Kentucky'" (with plans). "Naval Notes, Home and Foreign." 25th January.—"A National System of Yacht Measurement." "Yachting Notes" (with good instantaneous photographs of racing yachts). "The Pygmy Motors." "Naval Notes, Home and Foreign."

Le Moniteur de la Flotte. Paris: 4th January, 1896.—"Official Naval Publications." "The New Constructions." "The Navy in 1895." "The Higher School of War for the Fleet." "Colonial Notes." "Notices of Books." "Naval Chronicle, Home and Foreign." 11th January.—"The Torpedo-boats in Reserve." "The Higher School of War for the Navy." "Colonial Notes." "Naval Chronicle, Home and Foreign." 18th January.—"Warlike Preparations." "The Parliamentary Commission on the Navy." "Colonial Notes." "Naval Chronicle, Home and Foreign." 25th January.—"*À propos* of Despatch-vessels." "Preparation of the Budget for 1897." "Colonial Notes." "Naval Chronicle, Home and Foreign."

La Marine Française. Paris: 10th January, 1896.—"The Parliamentary Enquiry into the Navy: Evidence of Vice-Admiral Gervais." "The armoured-cruiser 'Dupuy-de-Lôme.'" "The system of making Payments and Responsibility." "Naval Chronicle, Home and Foreign." "The Navy in 1896"; (*continued*). 25th January.—"Naval Policy." "Yachting Notes." "Naval Chronicle, Home and Foreign." "The Merchant Navy." "The Navy in 1896" (*continued*).

GERMANY.—*Marine Rundschau.* Berlin: February, 1896.—"The Value of Stars in Navigation." "Blockade in relation to Naval Strategy"; translated from Captain Mahan's paper in November JOURNAL of United Service Institution. "The Construction of the Emperor Alexander III. Harbour at Libau." "Oldenburg-Bremen and Weser Quarrels." "Foreign Naval Chronicle." "Book Notices."

ITALY.—*Rivista Marittima.* Rome: January, 1896.—"Belleville and Lagrafel d'Allest Boilers." "The Navy of the Grand Dukes Medici," by C. Manfroni. "The Naval Drama in the Far East." "The Armenian Question." Letters to the Director:—"Torpedo-cruisers"; "Electricity on War-ships"; "Perturbations of the Compass"; "Employment of Torpedoes." "Foreign Naval Notes." "Notices of Books."

RUSSIA.—*Morskoi Sbornik.* St. Petersburg: December, 1895.—"Remarks on the construction of the Emperor Alexander III. Harbour at Libau" (*concluded*). "Contraband of War" (*concluded*). "Water-tube Boilers in the English Navy."

SPAIN. — *Revista General de Marina.* Madrid: January, 1896. — "The Sea." "Grave Defects in Fast Cruisers." "Description and use of the 'Ciclonoscope.'" "The Cemetery of the Atlantic." "Rescue from Shipwrecks." "Cruise of the Gun-boat 'Quiros.'" "Naval Journals." "Naval Chronicle, Home and Foreign." "Book Notices."

MILITARY.

AUSTRIA-HUNGARY.—*Mittheilungen über Gegenstände des Artillerie- und Geniewesens.* No. 1: Vienna, 1896.—"Some observations on the Theory of the so-called Statical Crusher-apparatus." "On the Construction of necessary Shelters against Cold" (with plates). "Examination of wooden buildings affected with the germs of Dry-rot." "Military Notes, Home and Foreign." "Report on the health of the I. and R. Army for October, 1895. "Notices of Books."

Militär-Zeitung. No. 1. Vienna: 8th January, 1896.—"On the Revision of our Defensive Organisation." "The new Promotion Regulations." "General Dragomirow on the Training of the Russian Cavalry." Military Notes, Home and Foreign." No. 2. 16th January.—"The New Promotion Regulations." "The Millennium Celebration of Hungary." "The new Bicycle Regulations for the Prussian Army." Military Notes, Home and Foreign." No. 3. 24th January.—"The Dismissal of Count Thun." "The Austrian Watch on the Rhine a hundred years ago." "Military Notes, Home and Foreign."

FRANCE.—*Revue Militaire de l'Étranger.* 7th January.—"The Field Artillery in Germany and Austria"; outline of the regulations concerning its tactical action. "The Submarine Telegraph Cables of the World" (with plate). "The New Cavalry Regulations of the German Army."

Revue du Cercle Militaire. 4th January.—"The Italians in Abyssinia"; summary of events. "La boussole-guide pantométrique"; description of a new kind of pocket compass of no particular practical advantage. "The Imperial German Manœuvres from a British point of view"; full *précis* and translation from the letters of the *Times* correspondent last year. 11th January.—"The Officers of Reserve in France"; detailed analysis of the organisation to supply officers in time of war. 18th January.—"The Italians in Abyssinia." "A new process for disinfection in the Russian Army"; shows an adaptation of the large-size cooking pots in use in the Russian Service for sterilising water, milk, etc., and disinfecting small articles generally. "The Officers of Reserve in France." 25th January.—"The supply of sailors to the British Navy." "The Officers of Reserve in France."

Le Spectateur Militaire. 1st January.—"L'année militaire, 1895"; summary of events. "Command and Initiative," by Colonel Chabert. "The Grand Manœuvres of 1895," by M. de Guymarais. "The Army Estimates," by Noel

FOREIGN PERIODICALS.

NAVAL.

AUSTRIA-HUNGARY.—*Mittheilungen aus dem Gebiete des Seewesens.* No. 1. Pola and Vienna: January, 1896.—"Theory of Naval Tactics." "The Solomon Islands" (with some good photographic views). "Types of German War-ships" (with photographs). "The English Torpedo-boat Destroyers." "The Grounding of a French Naval Division." "Foreign Naval Notes." "Notices of Books." No. 2. February.—"Theory of Naval Tactics" (*concluded*). "Types of United States Cruisers" (with photographs). "Petersen's and Macdonald's Water-tube Boilers." "Wave-Measurement in the Atlantic." "Steam-steering Engines." "Improvements in Water-tube Boilers." "The Temperley Coaling Apparatus." "The French Submarine-boat 'Goubet II.'" "Foreign Naval Notes." "Book Notices."

FRANCE.—*Revue Maritime et Coloniale.* Paris: January, 1896. Has not been received up to time of going to press.

Le Yacht. Paris: 4th January, 1896.—"The War Navies in 1895." "Yachting Notes." "The Projected Tax on Yachts." "The German battle-ship 'Brandenburg'" (with fine instantaneous photograph of ship steaming full speed). "Naval Notes, Home and Foreign." 11th January.—"The Higher School of War for the Navy." "The War Navies in 1895" (*concluded*). "English Shipbuilding in 1895." "Yachting Notes." "The Russian Torpedo-boat Destroyer 'Sokol'" (with photograph). "Naval Notes, Home and Foreign." 18th January.—"The Proposed Tax on Yachts." "Yachting Notes." "The New Constructions at end of 1895." "The French battle-ship 'Marceau'" (with photograph). "The new American battle-ships 'Kearsage' and 'Kentucky'" (with plans). "Naval Notes, Home and Foreign." 25th January.—"A National System of Yacht Measurement." "Yachting Notes" (with good instantaneous photographs of racing yachts). "The Pygmy Motors." "Naval Notes, Home and Foreign."

Le Moniteur de la Flotte. Paris: 4th January, 1896.—"Official Naval Publications." "The New Constructions." "The Navy in 1895." "The Higher School of War for the Fleet." "Colonial Notes." "Notices of Books." "Naval Chronicle, Home and Foreign." 11th January.—"The Torpedo-boats in Reserve." "The Higher School of War for the Navy." "Colonial Notes." "Naval Chronicle, Home and Foreign." 18th January.—"Warlike Preparations." "The Parliamentary Commission on the Navy." "Colonial Notes." "Naval Chronicle, Home and Foreign." 25th January.—"*À propos* of Despatch-vessels." "Preparation of the Budget for 1897." "Colonial Notes." "Naval Chronicle, Home and Foreign."

La Marine Française. Paris: 10th January, 1896.—"The Parliamentary Enquiry into the Navy: Evidence of Vice-Admiral Gervais." "The armoured-cruiser 'Dupuy-de-Lôme.'" "The system of making Payments and Responsibility." "Naval Chronicle, Home and Foreign." "The Navy in 1896"; (*continued*). 25th January.—"Naval Policy." "Yachting Notes." "Naval Chronicle, Home and Foreign." "The Merchant Navy." "The Navy in 1896" (*continued*).

GERMANY.—*Marine Rundschau.* Berlin: February, 1896.—"The Value of Stars in Navigation." "Blockade in relation to Naval Strategy"; translated from Captain Mahan's paper in November JOURNAL of United Service Institution. "The Construction of the Emperor Alexander III. Harbour at Libau." "Oldenburg-Bremen and Weser Quarrels." "Foreign Naval Chronicle." "Book Notices."

ITALY.—*Rivista Marittima.* Rome: January, 1896.—"Belleville and Lagrafel d'Allest Boilers." "The Navy of the Grand Dukes Medici," by C. Manfroni. "The Naval Drama in the Far East." "The Armenian Question." Letters to the Director:—"Torpedo-cruisers"; "Electricity on War-ships"; "Perturbations of the Compass"; "Employment of Torpedoes." "Foreign Naval Notes." "Notices of Books."

RUSSIA.—*Morskoi Sbornik.* St. Petersburg: December, 1895.—"Remarks on the construction of the Emperor Alexander III. Harbour at Libau" (*concluded*). "Contraband of War" (*concluded*). "Water-tube Boilers in the English Navy."

SPAIN. — *Revista General de Marina.* Madrid: January, 1896. — "The Sea." "Grave Defects in Fast Cruisers." "Description and use of the 'Ciclonoscope.'" "The Cemetery of the Atlantic." "Rescue from Shipwrecks." "Cruise of the Gun-boat 'Quiros.'" "Naval Journals." "Naval Chronicle, Home and Foreign." "Book Notices."

MILITARY.

AUSTRIA-HUNGARY.—*Mittheilungen über Gegenstände des Artillerie- und Geniewesens.* No. 1: Vienna, 1896.—"Some observations on the Theory of the so-called Statical Crusher-apparatus." "On the Construction of necessary Shelters against Cold" (with plates). "Examination of wooden buildings affected with the germs of Dry-rot." "Military Notes, Home and Foreign." "Report on the health of the I. and R. Army for October, 1895. "Notices of Books."

Militär-Zeitung. No. 1. Vienna: 8th January, 1896.—"On the Revision of our Defensive Organisation." "The new Promotion Regulations." "General Dragomirow on the Training of the Russian Cavalry." Military Notes, Home and Foreign." No. 2. 16th January.—"The New Promotion Regulations." "The Millennium Celebration of Hungary." "The new Bicycle Regulations for the Prussian Army." Military Notes, Home and Foreign." No. 3. 24th January.—"The Dismissal of Count Thun." "The Austrian Watch on the Rhine a hundred years ago." "Military Notes, Home and Foreign."

FRANCE.—*Revue Militaire de l'Étranger.* 7th January.—"The Field Artillery in Germany and Austria"; outline of the regulations concerning its tactical action. "The Submarine Telegraph Cables of the World" (with plate). "The New Cavalry Regulations of the German Army."

Revue du Cercle Militaire. 4th January.—"The Italians in Abyssinia"; summary of events. "La boussole-guide pantométrique"; description of a new kind of pocket compass of no particular practical advantage. "The Imperial German Manœuvres from a British point of view"; full *précis* and translation from the letters of the *Times* correspondent last year. 11th January.—"The Officers of Reserve in France"; detailed analysis of the organisation to supply officers in time of war. 18th January.—"The Italians in Abyssinia." "A new process for disinfection in the Russian Army"; shows an adaptation of the large-size cooking pots in use in the Russian Service for sterilising water, milk, etc., and disinfecting small articles generally. "The Officers of Reserve in France." 25th January.—"The supply of sailors to the British Navy." "The Officers of Reserve in France."

Le Spectateur Militaire. 1st January.—"L'année militaire, 1895"; summary of events. "Command and Initiative," by Colonel Chabert. "The Grand Manœuvres of 1895," by M. de Guymarais. "The Army Estimates," by Noel

Desmaysons. "Decorations, Crosses, and Medals," by C. Boissonnet. "Events of the past fortnight." "The death of Max Lebaudy." "The Soldier's meat ration again." 13th January.—"The Regimental Schools," by Noel Desmaysons. "The Grand Manœuvres in 1895." "Crosses, Medals, and Decorations." "Events of the fortnight"; this summary is always worth reading.

Revue d'Artillerie. January.—"Field Howitzers or High Explosives"; translated from the Italian, worth reading; concludes in favour of howitzer. "The Photochronographe of Messieurs Crehore and Squier," by Lieut.-Colonel Lafay. "The Corps of Artillery of France"; historical study by Captain Reviers de Mauny (*continued*). "Distribution of deformations in metals under strains and compression." "Study on the Bicyclette." "Notes." "Book Notices," etc.

Journal des Sciences Militaires. January.—"Stratégie de Combat," by General Lewal. XXVIII., Flank attacks; XXIX., Execution of the Turning Movement; XXX., Changes of Front; XXXI., Precautions against Flank Attacks. "Observations on the Combat of a Battalion," by M. Cousin. "Frontiers and Fortresses of the Principal Powers": Spain, by M. Amphoux. "Critical Study of the Operations of the XIVth German Corps in the Vosges and the Valley of the Saône, October, 1870," by M. de Cissey. "Reply to the Ministerial Inquiry into the Question of the Military Employment of the Instructional Cadres in the Infantry, and of the re-engaged N.C.O.'s in particular," by M. J. Blomdus. "General Alexis Dubois and the Cavalry with the Armies of the North and of the Sambre et Meuse in 1794 and 1795," by M. Leon Hennet. "Wissembourg — Froeschweller — Chalons—Sedan—Châtillon—La Malmaison" (*continued*).

L'Avenir Militaire. 3rd January.—"The Balance-sheet of 1895"; a violent leader against civilian Ministers of War." "Cryptography"; a series of articles, well worth study, running throughout the month. 7th January.—"Colonial Questions"; suggested by recent events in South Africa — lays stress on the absence of superfluous population in France as a reason for not embarking on colonial rivalry with England and Germany. "The Contracts of Djelfa"; analysis of documents showing malversation. "The Railways of Alsace-Lorraine"; summary of the article in the *Revue Militaire de l'Étranger*, notes the increase of mobility conferred on the German Frontier Forces. "The slowness of Promotion." 10th January.—"Peace or War"; discusses the prospects of international arbitration. "The Defences of Switzerland." 14th January.—"The German Infantry in 1896"; discusses the future of the new fourth half-battalions. "The Initiative on the battle-field." "How to inculcate habits of initiative during instruction"; a thoughtful article, worth reading. 17th January.—"The Powers and their Colonies"; anticipates speedy backdown on the part of England to both America and Germany. It appears that America possesses a large fleet of sea-going battle-ships. "The Thouvenin Phonotelemeter"; a new range finder, based on the velocity of transmission of sound; nothing original. "The new Naval Constructions." "Before Sadowa"; review of the Duc de Persigny's memoirs. 21st January.—"The Frauds of Djelfa." "The Lebaudy incident." "The Siamese Convention." 24th January.—"The 21st Article of the law on recruiting." "The Supply of Harness and Saddlery"; note on the new regulations just issued for these services. "Tonkin and Madagascar." The writer trusts that the administrative blunders which have ruined Tonkin will not be repeated. 28th January.—"The re-engaged Non-Commissioned Officers." "The Contracts of Djelfa." "Physical Exercises and the Education of the Soldier." "The Italians at Adigrat."

GERMANY.—*Militär- Wochenblatt.* 4th January.—"Life of Field-Marshal Hermann von Boyen"; review of life of the Field-Marshal by Friedrich Meinecke. Boyen was one of the chief coadjutors of Scharnhorst in the great reforms of

the Prussian Army. "Mistakes and prejudices as to the action of the Curb-bit," by Colonel Spohr, a well-known authority. 8th January.—"The Cholera outbreak in 1894 in the Army, and precautionary measures adopted." "Wheat and other grain foods; their importance for the Army." "New French Musketry Regulations." "Notes on Field-glasses." 11th January.—"Suvarrow in Italy and Switzerland, 1799." "A new target for Artillery aiming drill" (see Notes above). 15th January.—"Attempted Invasions of England," by Captain Freiherr von Lüttwitz. "Mistakes and prejudices as to the action of the Curb-bit" (*continued*), by Colonel Spohr. "Suvarrow in Italy and Switzerland, 1799" (*continued*). 18th January.—"Attempted Invasions of England" (*concluded*), by Captain Freiherr von Lüttwitz. "Mistakes and prejudices as to the action of the Curb-bit" (*continued*), by Colonel Spohr. "The losses of the French Army during the last century." 22nd January.—"Notes on Military equipment in Central Africa" (see Notes). "Suvarrow in Italy and Switzerland, 1799" (*concluded*). "Italian preparations for defence in Erythrea." 25th January.—"The training of Field Artillery for War"; discussion of points raised in Colonel von Reichenau's book. 29th January.—"Statistics relating to suicide in the German Army" (see Notes). "The German Empire, 1871-1895." "The Krag-Jörgenson rifle in the United States."

Deutsche Heeres Zeitung. 1st January.—"Mounted orderlies eighty years ago"; historical essay showing the regulations in force for orderlies in 1814 in Prince Schwarzenberg's army, issued by Radetzky, his Chief of Staff; very interesting. "Military and Political hopes and aspirations"; review of a book by Otto von Monteton, strongly recommended; note the criticism on "long-distance rides." 4th January.—"Extracts from General Dragomirow's orders"; ought to be translated from the original and circulated in our own Service. "The 13th French Army Corps in 1870"; study of the part played by Vinoy's corps in the Franco-German War; worth reading. 8th January.—"Military uniform in German Art"; an amusing analysis of conventional errors in the art treatment of military subjects. 11th January.—"Examination for entrance and during the course of study at the 'Nikolaus General Staff Academy'"; very interesting analysis of the competition for the Russian General Staff; competitors, 350; passed, 235; admitted, 130. 15th January.—"Trials with lubricated and unlubricated cartridges at the Officers' School of Musketry (Russia) with the new small-bore rifle"; worth reading; both with and without lubrication the rifles appear to have shot better after 1,000 rounds than when new; compare our own reports. 18th January.—"The Siberian Railway"; evidently *not* written by a railway expert. 22nd January.—"The Russian Cavalry Divisions"; note interesting conclusions as to the value of the Cossacks in the charge—eye-witness testimony. 25th January.—"The 13th French Army Corps in the War of 1870" (*concluded*). "Naval and Military Notes."

Jahrbücher für die deutsche Armee und Marine. Berlin: February, 1896.—"Memorial Notes on the Officers and Officer-aspirants of the German Cavalry who were killed or died during the War of 1870-71." "Friedrich von Hellwig: a study of Partisan Warfare in 1814" (*continued*). "Where should the Commanding Admiral station himself in a Naval Action?" "Some Ideas on the Outlines of our Military Educational System, and its relation to Infantry Training." "Pensioned Officers." "Military Life in the Thirty Years' War." "Military Notes from Russia." "Book Notices."

Neue Militärische Blätter. No. 1. Berlin: January, 1896.—"Feldzeugmeister Ritter von Benedek as Soldier, General, and Leader of an Army." "The French Expedition to Madagascar." "A Study on the Training of Field Artillery." "The Recruiting and Organisation of the Russian Army." "A new Military Bicycle." "Strategical-Technical Problems." "Military Correspondence." "Military Notes, Home and Foreign." "Book Notices."

ITALY.—*Rivista di Artiglieria e Genio.* Rome: December, 1895.—"On the Design of a Rifle." "The Italian Engineers" (with two plates), by Marzocchi, Lieut.-Colonel of Engineers. "Mountain Artillery," by Allason, Lieut.-Colonel of Artillery. "Time and Double-Action Mechanical Fuses." "Miscellaneous Notes." "Military Notes, Home and Foreign." "Notices of Books."

SPAIN.—*Revista Técnica de Infantería y Caballería.* No. 1. Madrid: 1st January, 1896.—Swiss Military Institutions." "Military Organisation of Cyclists in the United States." Military Expeditions to Cuba." "Military Life in the 16th Century." Book notice: "Life of General D. C. O'Donnel." No. 2. 15th January.—"Swiss Military Institutions" (*continued*). "Wars of Independence in America: Battle of La Cruz (Costa Firme) in August, 1819." "Military Expeditions to Cuba." "Some Remarks on Cavalry."

Memorial de Ingenieros del Ejército. No. 12. Madrid: December, 1895.—"Our Expeditionary Company." "The Engineer Troops in the French Grand Manœuvres of 1895" (with photograph). "The Wells-Light in the Practical School of the Railway Battalion." "On a more simple method of Planometry." Naval Notes, Home and Foreign." "Military Notes." "Scientific Chronicle."

SWITZERLAND.—*Revue Militaire Suisse.* January.—"Reflections on our Military condition," by Colonel Camille Favre. "Study for a new organisation of the Infantry Instruction," by Colonel Isler. "Our Artillery Parks, present and future," by Lieutenant J. Vallotion. "The Great Condé and his Campaign of 1674" (with map). "The New French Field-Howitzer."

UNITED STATES. — *The United Service.* January. — "Prince Eugene at Belgrade." "Korea in July, 1895," by W. McE. Dye, Military Adviser to His Korean Majesty. "The English Soldier as he was and as he is," by Colonel Henry Knollys; reprint from *Blackwood.* "Reminiscences of Seattle, Washington Territory, and the United States Sloop-of-War, 'Decatur,' during the Indian War of 1855-6," by Commodore T. S. Phelps, U.S.N. "Notes on England's Navy."

Journal of the Military Service Institution. January.—"The Campaign against the Sioux in 1876," by Colonel Hughes; an exceedingly interesting account of the operations in which Colonel Custer and the 7th Regiment of Cavalry were overpowered and massacred at Big Horn Creek. "Supplying Armies in the field," Prize Essay by Captain Sharpe; gives many interesting details of American experience. "Carbines for Foot Artillery." "The Squad Formation." "Light Artillery target practice," by Lieutenant Davis; a plea for range-finders. "Terrain in Military operations," by Captain Gresham. Amongst the translations, is one from the *Revue d'Artillerie* on German Field Artillery Targets, fixed and moving, with full illustrations and details.

NOTICES OF BOOKS.

Ironclads in Action: a Sketch of Naval Warfare from 1855 to 1895, with some Account of the Development of the Battle-ship in England. By H. W. WILSON. With an Introduction by Captain A. T. MAHAN, U.S.N. With Maps, Plans, and Illustrations. (Two vols.) London: Sampson Low, Marston, and Co.

Although there is nothing new in the historical portion of Mr. Wilson's book, yet the author has undoubtedly rendered a great benefit to that largely increasing number of persons who, in these days, are desirous of making themselves thoroughly acquainted with naval matters, but who have not the means of studying the many authoritative works dealing with the naval operations of the last forty years, by the concise and readable manner in which he has marshalled together in his two interesting volumes the various naval actions, which have taken place in various parts of the globe since the Crimean War.

The fact that Captain Mahan should have contributed the introductory chapter is itself a testimony to the merit of Mr. Wilson's work, which must be peculiarly gratifying to him; the book is not only a history of "Iron-clads in Action," but it also traces the growth and development of the modern battle-ship, involving as it does a revolution in the instruments and appliances of naval warfare quite unparalleled in the previous history of the world. As Captain Mahan says in his introduction:—

"Its title, 'Iron-clads in Action,' is narrower than its actual scope, for it has inevitably introduced many episodes concerning vessels to which the term iron-clad can scarcely be strictly applied. But, by collating the experiences of vessels of all kinds during these eventful thirty years, it is in form an appeal to history, and that of the period which, if distinguished by a few exceptionally striking events, is yet that of the great transition which has so powerfully disturbed the mental processes and professional convictions of naval officers. It is, therefore, a contribution to the very desirable end of disposing men to pause, to reflect, to see really where they have come out at the end of these many years of disquieting hurry and change, and to ask whether, after all, the lessons of the thirty years have changed the fundamental principles, as derived from earlier days, upon which their future action must be based. If not, the problem now confronted is simply one of adaptation, of fitting ancient truths to new conditions."

Starting with the genesis of the iron-clad in the final period of the Crimean War, Mr. Wilson next devotes several chapters to the principal naval incidents of the Civil War between the Northern and Southern States, including, of course, the memorable conflict between the "Merrimac" and the "Monitor," which latter ship may undoubtedly claim to be the parent of all the later turret-ships. Chapter X., which describes the battle of Lissa, fought on the 20th July, 1866, between the Austrians and the Italians, is, most naval readers will probably consider, the best in the book. The description of the events leading up to and of the battle itself is very graphic, and the causes of the Italian defeat, in spite of her incomparably finer fleet, are clearly shown:—"Italy chose the royal road to defeat. She built a great ironclad fleet without training officers and men to take it into action; she forgot that ships alone are valueless, and that Armstrong guns, be they never so heavy, must have men behind them who can shoot straight. She spent millions on material without considering whether her money was wisely expended; she neglected that preparation and organisation which are the whole essence of success in war; she forgot to train admirals as she forgot to train

sailors. She had no naval staff with information and plans of action ready. At the supreme moment she selected a commander of Chinese dilatoriness and incapacity"; and the result was that the Austrian Admiral with a much inferior fleet won an easy victory. The Italians fought bravely, "but bravery of itself does not win battles," and Professor Laughton deduces, as the "great tactical lesson of the action, that with twelve ironclads against seven, the actual condition of the fight was that three were opposed to the seven and were beaten by them." ("Studies in Naval History," p. 184). So that the tactical rule that forbids undue scattering of force holds as good for ironclads as ever it did for wooden ships.

The naval events of the South American Wars are all described in turn, as also the naval history of the Franco-German and Russo-Turkish Wars, and the bombardment of Alexandria by our own fleet in 1882. Then follow the French operations in Tunis and against China, both so insignificant, that they are hardly worth the trouble Mr. Wilson devotes to them, while four chapters are given to an elaborate description of the naval operations during the late war between China and Japan, and the lessons to be drawn from the battle off the Yalu. Experts have, however, already decided that there was nothing to be learnt from that war, which was not well known before, and no deductions from the Yalu can throw any light as to the result of a naval action between the fleets of two of the Great Western Powers. Mr. Wilson is a bold man when he, in his chapter on the "Naval Battle of To-morrow," attacks such a thorny problem as the question of how the great naval battle of the future is to be fought, a problem on which great naval experts are not agreed; while in his chapters on "Southern Warfare against Commerce" and "Blockade," as well as in one or two other places where he touches questions of International Law, he also enters on decidedly debatable ground. With his chapter on the "Development of the English Battle-ship," and his appendix dealing with the "Development of the French Navy, 1855-1895," there is no fault to be found. In spite of certain defects inseparable from any attempt to cover so large a field as he has done, Mr. Wilson is to be heartily congratulated on having compiled a work, which will prove most valuable as a book of reference, and which fills a decided gap in naval literature. His two volumes are admirably provided with maps, plans, and good reproductions of photographs of several prominent English and foreign war-ships.

Although no attempt in the above notice has been made to criticise a work which contains so much valuable matter, yet it is necessary to take serious exception to one statement of Mr. Wilson's, which is calculated to do his own country harm in the United States, where his book appears already to be very popular. Commenting on what is known as the Trent affair, Mr. Wilson gives the whole credit of averting war between England and the Northern States to the late President Lincoln, and lays stress upon what he calls the peremptoriness of the demand of our Government for the release of Messrs. Mason and Slidell, the Southern Commissioners. Mr. Wilson has written without having carefully read up his subject—a grave fault where a book is intended to be a text-book. Had a peremptory demand been made on the Cabinet of Washington for the surrender of Messrs. Mason and Slidell, it would have been met with a direct refusal, and nothing could have prevented war. It was the late lamented Prince Consort who wrote the conciliatory dispatch which formed the golden-bridge by which the Northern Government, without any loss of self-respect, was enabled to retreat with honour from the utterly untenable position which it had taken up. It was the last and, perhaps, the greatest of the many good services which that wise Prince was able to render to his adopted country; and it is much to be regretted that Mr. Wilson should have missed the opportunity he has had of teaching the rising youth of the United States that England was not so uniformly hostile to the North as she is generally represented to have been by American writers.

Geography of Marocco. By Colonel Don TEODORO BERMÚDEZ REINA, of the Spanish Artillery. (8vo., 324 pages.) With four Plates and one Map. Barcelona, 1895.

The author of the above work is well known in London, he having served here for some time, and until quite recently, as Military Attaché at the Spanish Embassy. Some time previous to his coming to this country he served in the same capacity at the Spanish Legation in Tangier, during which period he acquired an extensive knowledge of Marocco, and wrote an interesting pamphlet on the subject of the military organisation of that country. This work now appears as an appendix to the larger work which we are now noticing.

Colonel Bermúdez devotes much energy and industry to anything he takes up, and his writings are therefore always worthy of attention. He begins with a brief preface, in which he explains how he has arrived at certain of the information contained in his map of Marocco which is appended in the book. He accepts the itineraries as mapped by Count de Chavagnac, and he says that he cannot reconcile those in Colonel Colvile's book, "In Petticoats and Slippers through Marocco," with what he considers to be the correct reading of the positions of the districts, rivers, etc., and their designations and distances, and he further notes that nearly all the writers in this part of the world differ considerably in this respect. The author fully recognising these discrepancies and the consequent difficulty of deducing from them any really reliable result, craves indulgence for any shortcomings which may be noticeable in his work.

The introduction is principally ethnographical. He traces the history of Marocco from the earliest time, viz., 650 B C., in the days of Pharaoh Nego of the XXIVth Dynasty. Then follow four chapters and the appendix above alluded to.

Chapter I. deals with the geographical situation, boundaries, capes, mountain ranges and rivers.

Chapter II. gives the division of the country into rayons or districts, viz. :— 1. District of Ujda. 2. Dara. 3. Teza. 4. Sources of the Muluya and Sebu. 5. Riff. 6. Between the Valley of the Sebu, the Atlantic, and Mediterranean. 7. Valley of the Sebu. 8. The Middle Atlas and the Plain between the Bu-Regreb and the Morbea. 9. Between the rivers Morbea and Tensift and the Atlantic Coast. 10. Between the Tensift, the Great Atlas, and the Atlantic. 11. The Sus and Nun. 12. The Draa. 13. The Ziz and Guir. 14. Oases of Figuig and Tuat. He then deals with the fortresses of Ceuta and Melilla, and describes these districts, etc., in detail. Originally, as the author states, the empire was divided into eighteen principal districts, each being governed by a Kaid. The Sultan Muley Hassan, however, divided the territory of his States into 330 kaidates, most of them independent of each other. The author names and describes the different tribes as well as the geographical conditions of the territory they inhabit, which he treats also from a military point of view. To this chapter belong the four plans of the cities of Tangier, Tetuan, Larash, Salé and Rabat, and Mogador ; the fortifications of each are described and the armament classified. The author dwells naturally on the influence of Spain in that country, reminding his readers that the famous Spanish Artillerist, Cristobal Lechuga, built the fortifications of Mehedia. These details regarding the defences of the principal Moorish ports and towns are of special military interest. Colonel Bermúdez deals at some length with the remaining Spanish strongholds in Marocco, he advocates earnestly the construction of a proper port at Melilla, and the same for Ceuta, together with a Moorish Custom House on the frontier of Ceuta and Marocco. The chapter ends with some notes as to the proposed rectification of the Franco-Moorish frontier. The present frontier line between Algiers and Marocco is purely imaginary, and Colonel Bermúdez is of opinion that it is only natural that the French nation should require and have a frontier definitely marked out by natural features, and that as the possession of the oasis of Figuig is essential, the natural

frontier between these two countries would be the Guir river on the Atlas side, and between the Atlas and Mediterranean it would be the right bank of the Uizert and Muluya. This means a large increase to French territory, as will be seen by looking at a map. Colonel Bermúdez asks, "Who will prevent France from taking this slice of territory?" Marocco (the most interested) cannot certainly prevent it. England, he says, does not much care so long as no other nation acquires a port on the Mediterranean seaboard of Marocco. She may grumble, but it will not come to more than that, no more than it did when the French acquired Algiers in 1830. Italy, though she will not like it, would not dream of making such an occurrence a *casus belli*. Spain cannot hinder it by force of arms, but it behoves her statesmen to do all they can to prevent it. The plans which accompany this chapter are clear enough. The map is, however, very indistinct and difficult to follow the names on. Moreover, the spelling of the names is in many cases so different from what one is accustomed to, that it is hard to identify them.

Chapter III. is devoted to a *résumé* of the geography of Marocco, in which the author treats of:—1. The Great Atlas. 2. Middle Atlas. 3. Little Atlas. 4. Lower Atlas. 5. Rivers: their tributaries and description of their courses. 6. Districts, important towns, races of the inhabitants, and their relations towards the Sultan. The information is given often in a convenient tabular form.

Chapter IV. deals with routes and itineraries, and describes carefully the various roads or paths which connect the different towns. They are none of them fit for wheeled traffic, are badly provided with bridges, and not always safe for travellers. Though we have already got the itineraries of Foucauld and others in this country, these cannot however fail to be of military use and interest. The book finishes with an appendix on the military organisation of the country; this was written in 1887, and possibly some of it may now be obsolete, as the author does not say that he has corrected it to date.

The work, however, must of necessity form a useful addition to the bibliography of Marocco, and it is only to be regretted that it is not published in a larger and more attractive style which it seems worthy of. J. C. D.

The British Army and the Business of War. By Colonel T. S. CAVE, 1st V.B. Hampshire Regiment, and Captain L. TEBBUTT, 3rd (Cambr.) V.B. Suffolk Regiment. London: Gale and Polden, 1896. 1s.

This pamphlet contains much that may, with advantage, be studied by those interested in army organisation. To be brief, it claims to show that the greater portion of the forces of this country is condemned by the mobilisation scheme to garrison duty, or is collected in immovable brigades at various places outside any likely area of combat in the event of invasion; that there is insufficient field artillery and transport; and that the formation of two army-corps for foreign service would dislocate the whole scheme of mobilisation for home defence.

The authors demand for the improvement of this state of affairs:—

1. That the Militia shall be liable for foreign service abroad, and that the Volunteers be liable for service in Ireland, in the event of war.
2. That nine army-corps be formed under the generals of their respective districts. Each corps to consist of a proportion of Regulars, Militia, and Volunteers. The first army-corps for foreign service to be composed of one brigade from each of the first three army-corps for home service, and their places supplied by Volunteers which are already assigned to the corps as supernumerary to the establishment.
3. That the field artillery be increased by 8,000 men from the garrison artillery, their places, in the event of invasion, being taken by Militiamen. Skeleton batteries would be formed with a small

permanent cadre, to be made up of Reserves and Militiamen, who would train with their batteries every year.

4. That Militia and Volunteer units raise and train their own transport.
5. More decentralisation of stores.

These suggestions are, to say the least, worthy of serious consideration. That a great addition would be made to our military resources by the enlistment of the Militia for foreign service, in case of war, is clear to any intelligent mind; and as much may be said of the suggestion to render Volunteers liable for service in Ireland in case of war, which it is presumed, is intended to mean invasion or contemplated invasion. The deficiency of transport for purposes of home defence is no imaginary one, but the authors—one of whom is a recognised authority on the subject—have not suggested any remedy, beyond the vague demand for the Militia and Volunteers to be permitted to organise their own, regimentally. The conversion of Militiamen into field artillerymen will not only startle the officers of the Royal regiment, but will cause the most sanguine believer in the Constitutional Force to hesitate; but there is really more in the suggestion than at first appears.

The pamphlet is well written, and deserving of careful consideration; not only because of the importance of the subject and the contentions, but because the authors are officers of recognised efficiency in the Volunteer force, and their opinions carry weight. R. H.

Studies in Diplomacy. From the French of Count BENEDETTI, French Ambassador at the Court of Berlin. London: Heinemann, 1896. Price, 10s. 6d.

The three papers of which this book consists appeared originally in the *Revue des Deux Mondes.* They contain the author's personal explanation of the diplomatic incidents immediately preceding the war of 1870, and replies to subsequent revelations and accusations on the part of his colleagues. They form, therefore, first-hand evidence of the greatest value as to the causes which provoked the war, but require to be very carefully cross-examined. Taken, each by itself, they will bear this cross-examination very fairly; but the author has made a mistake in binding the three together, for in replying to one set of accusations he loses sight of the bearing of these replies on the others, and in proving Bismarck's guilt he exculpates the Duc de Gramont, and *vice versâ.* The final paper, "My Mission to Ems," is subsequent to Bismarck's boast that he had falsified the Ems dispatch, and naturally makes the most of the admission, forgetting Caprivi's reply in the Reichstag, where he produced the original telegram, and in the opinion of all present sufficiently disproved Prince Bismarck's vain-glorious boast, which, moreover, had been already amply discredited by incidents already sufficiently attested. Had either Bismarck or the King really wished to precipitate the war, they would have seized the opportunity of the Luxemburg question, when the French Army was still armed with muzzle-loaders, and, as General le Brun has since shown, could not have horsed one-third of the guns actually put in the field in 1870.

The second paper, "Armed Peace and its Consequences," viz., universal liability to military service throughout Europe, only holds good if we accept the author's view of the evils this liability to service entails.

It is true that universal service is not the same boon to the nation in France that it is in Germany and Austria: this is due to special disadvantages under which the Republican form of government necessarily labours; but taking Europe as a whole, we venture to assert that if universal service is the consequence of the armed peace, then the armed peace has abundantly justified its existence; for, were it not for the cohesion and solidarity this universal service entails in a properly-organised society, all Europe would have long since been involved in the throes of social revolution—classes *versus* masses and capital *versus* labour—and the clock of progress would have been put back half-a-century.

In certain conditions of society, universal military service is simply the necessary complement to free education of children, and but for the physical training and habit of concentrated effort service in the ranks inculcates on the individual, whole nations would, ere this, have become a mere "literary proletariat" starving for want of character and energy to develop the potential wealth of their possessions.

The Forth and Clyde Ship Canal, in relation to the development of Commerce. By J. LAW CRAWFORD. London: MacLaren and Sons.

The title of this pamphlet is unfortunately chosen; "in relation to national defence and consequent security of commerce" is its real signification, and from this point of view the subject of it merits the closest attention.

The proposal it advocates is for a ship canal, following the line of the great geological trough which unites the mouths of the Forth and Clyde, which will effect a saving of some 500 miles between the east and west coasts, and afford an alternative route for our war-ships, by which they may be transferred in a few hours from the North Sea to the Irish Channel, or *vice versâ*.

The total length of cutting required is 29 miles, and the summit level 85 feet. No engineering difficulties present themselves, and the estimated cost is only £6,000,000. That the undertaking will pay commercially, on the scale projected, is beyond question to anyone conversant with the actual earnings of our properly-managed waterways; but it must be borne in mind that the maximum width and depth required for commercial success are far below the necessities of our battle-ships.

The author of the pamphlet has overlooked this point, and thereby materially damaged his case for Government assistance.

If the canal is to be the paying property his estimates and our own common sense lead us to believe it will be, then the money will be forthcoming with or without Government interference, and from a treasury point of view we would leave it to find its own salvation. But the actual estimate on which returns are calculated provides only for a depth of 26 feet, a width of 100 at bottom, and locks of 600 feet by 65 as a maximum. Now, the battle-ships of the British Navy draw 28 feet on an average, and want a few feet of water under their keels as well; they are also mostly of 75 feet beam. What they will be when the canal is finished it is difficult to predict, but no reduction in size is probable. If Government, therefore, supported the present proposals, they would make a very bad bargain, for when completed they would find themselves plus a canal their ships could not traverse, and minus the ships their subvention otherwise expended would have secured.

It is to be most sincerely regretted that such a good idea should find such indifferent advocacy. Surely, when a sum of six to ten millions is at stake, it ought to have been worth while enquiring from the first coastguard officer at either terminal port what the dimensions of our first-rate ironclads actually are, and, when seeking to bolster up the value of the idea for National Defence purposes, to have enlisted the services of some competent naval strategist; instead of merely stringing together from all kinds of sources the opinions of men, good, bad, and indifferent, often given without any reference to the project before us.

THE ADVERTISEMENT DEPARTMENT OF THIS JOURNAL IS CONDUCTED IN S. H. BENSON'S ADVERTISING OFFICE, 129, FLEET STREET, E.C., WHERE ALL COMMUNICATIONS SHOULD BE ADDRESSED.